



A SHORT HISTORY  
OF THE  
INDIAN PEOPLE

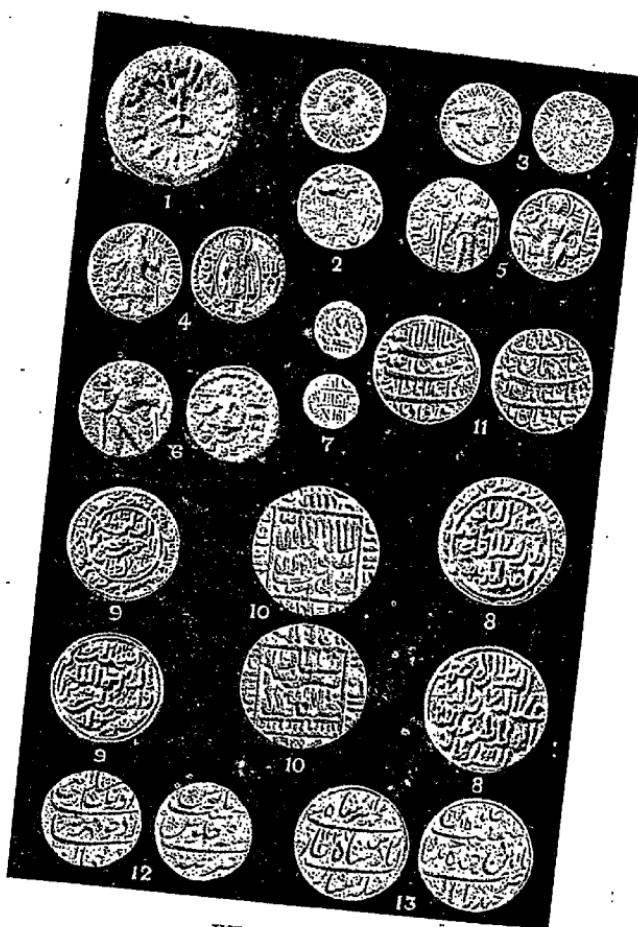


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# A SHORT HISTORY OF THE INDIAN PEOPLE

From the Earliest Times to  
the Present Day

BY

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## CONTENTS

	PAGE
THE LITTLE SWINEHERD, or, THE PRINCE IN DISGUISE . . . . .	13
THE NIGHTINGALE . . . . .	25
THE STEADFAST TIN SOLDIER . . . . .	57
THE EMPEROR'S NEW CLOTHES . . . . .	68
THE REAL PRINCESS . . . . .	85
THE UGLY DUCKLING . . . . .	87
THE FLYING TRUNK . . . . .	113
THUMBELISA . . . . .	136
THE LITTLE MERMAID . . . . .	173
THE TINDER Box . . . . .	236
THE CANDLES . . . . .	255
THE SNOW QUEEN . . . . .	260

# COLOURED PLATES

	PAGE
<b>THE LITTLE SWINHERD, OR THE PRINCE IN DISGUISE</b>	
" What do you want for that pipkin ? " asked the maid of honour	12
He up and kissed her .	16
<b>THE NIGHTINGALE</b>	
So he called his lord-in-waiting	28
" Little Nightingale ! " cried the kitchen-maid .	33
It was attended by twelve servants	39
What could <i>he</i> do ?	50
<b>THE STEADFAST TIN SOLDIER</b>	
" That's the wife for me ! " thought he	55
" Have you a pass ? " asked the rat	61
<b>THE EMPEROR'S NEW CLOTHES</b>	
" Oh, it is very fine," said the Emperor	72
" Why ! He has got nothing on ! " cried a little child	78
<b>THE REAL PRINCESS</b>	
There the Princess was to rest that night	83
<b>THE UGLY DUCKLING</b>	
The whole lot of them were in	94
The children wanted to play with it	99
" There's a new one ! "	105
<b>THE FLYING TRUNK</b>	
The trunk set off flying	116
He said he was the god of the Turks	122
" And now will you tell us a tale ? " said the Queen	127
Such a shower of meteors they had never seen before	131

# COLOURED PLATES

IX

## THUMBELISA

	PAGE
" She would make a very nice wife for my son "	138
A big cockchafer came flying along	142
The mole came and paid them a visit	147
The Swallow said good-bye	153
Thumbelisa had to spin away at her distaff	164
Every one brought Thumbelisa a present	170

## THE LITTLE MERMAID

A pretty statue of a handsome boy	175
She wanted to play with them	186
" But they hurt me so ! " said the little mermaid	191
He must surely have died if the little mermaid had not come	197
Many an evening she rose upon the water	208
She darted through the water	214
Right in front of her stood the handsome young Prince	219
She plunged from the ship into the sea	230

## THE TINDER BOY

She lay asleep on the dog's back	239
The biggest dog hurled them farther than all the rest	250

## THE SNOW QUEEN

She was fair and fine, but of ice	270
The Snow Queen calls for little Kay	Frontispiece
Gerda threw the red shoes out again	277
She looked up at the old dame's sunbonnet	288
The crow said " Caw ! caw ! Goo' day ! Goo' day ! "	294
She called his name	299
" She shall play with me," said the little robber-girl	310
The robber-girl lifted Gerda up	319
She was met by a whole regiment of snowflakes	330
The very blocks of ice danced about with joy	335

## PREFACE

**T**O Hans Christian Andersen might fitly be applied the title so happily bestowed by the natives of Samoa on Robert Louis Stevenson : Tusitala, the "Teller of Tales" For more than half a century the great Danish story-teller has been beloved by children in all parts of the world, and nowhere has he more devoted admirers than in Great Britain and those lands where English is the common tongue As has been well said, "Andersen was a Norseman, and the blood of Norsemen is in our veins"

This series of Colour Books being chiefly designed for younger children, only those stories have been included which are most suitable for the purpose Editions containing the whole of Andersen's fairy stories—sixty or more in number—can be obtained in various forms from the same publishers.

For those who here make first acquaintance with Andersen, it may be well to state that he was born at Odense, in the Baltic island of Funen, on April 2, 1805. His first fairy tales were published when he was about thirty years of age "I have written them," he wrote to a friend, "just as if I were telling them to a child" That, no doubt, was the reason of his success, though as a matter of fact the stories were not at first at all highly regarded Popularity came later, and he died, greatly honoured, at his country house near Copenhagen on August 4, 1875

H G





"What do you want for that pipkin?" asked the maid of honour  
"I want ten kisses from the Princess," said the swineherd  
"Good gracious!" said the maid of honour

श्रीमती वाल भवा जीन, पस्तफार  
रत्नगढ़ (राजस्थान)

# FAIRY STORIES FROM HANS CHRISTIAN ANDERSEN

## THE LITTLE SWINEHERD OR THE PRINCE IN DISGUISE

**T**HERE was once a poor Prince: he had a kingdom, but it was a very little one; still it was large enough to marry upon, and to marry he was determined.

Now, it was rather bold of him to make up to the Emperor's daughter and say to her right out, "Will you have me?" Yet he did so, for his name was known far and wide, and there were hundreds of princesses who would have been very glad to say "Yes," if they had been asked. But did the Emperor's daughter do so? Well now, you shall hear.

On the grave of the Prince's father grew a rose-tree—a very lovely rose-tree! It only bloomed

once in every five years, and then it only bore a single rose, but that was so sweet that by merely smelling it you forgot all your cares and sorrows. The Prince had also a nightingale which could sing as though all the lovely songs in the world were in its little throat. The Princess was to have both the rose and the nightingale, and that is how it came about that they were both put into silver cases and sent to her.

The Emperor had them borne before him into the large room where the Princess used to walk and play at "visitors" with her ladies-in-waiting, and when she saw the cases, with the presents in them, she clapped her hands for joy.

"Only fancy if it were a little pussy-cat!" said she. But it turned out to be a rose-tree with a single beautiful rose.

"How prettily it is made!" said all the Court ladies

"It is more than pretty," said the Emperor.  
"It is genteeel!"

But the Princess felt the rose, and immediately was ready to burst into tears.

"Fie! Papa," said she, "it is not artificial after all, it is *real!*"

"Fie!" said all the Court ladies; "it is *real!*"

"Let us see what is in the other case before we

lose our tempers," said the Emperor, and so the nightingale was produced, and it sang so sweetly that for the moment it was quite impossible to find any fault with it

"*Superbe ! Charnant !*" cried the Court ladies, for they all chattered French ; it was hard to say which of them chattered worst.

"The bird reminds me of the late Empress's musical-box !" said an old courtier "Ah, yes ! it's just the same tune, and the same time."

"Yes," said the Emperor, and began to cry like a child.

"But it is not a real bird, I hope," said the Princess.

"Yes, it is a real bird," said those who had brought it.

"Indeed ! then let it fly away !" said the Princess, and she would on no account hear of the Prince coming to see her

But he was not to be rebuffed. He smeared his face all over with black and brown, pressed his cap down over his eyes, and knocked at the palace door.

"Good morning, Emperor !" said he "Could I not take service in the palace here ? "

"Well, there are so many applicants already," said the Emperor ; "but let me see, I very much

So all the court ladies stood around, spreading out their dresses, and he up and kissed her.





want someone who can look after the swine, for we have lots of them."

So the Prince was appointed the Imperial swineherd. They gave him a wretched little shed close to the pigstye, and there he had to live. The whole day long he sat and worked, and by evening had made a pretty little pipkin, with bells all round it, and as soon as ever the pipkin began to boil, the bells tinkled so prettily, and played the old melody—

"Ah ! thou darling, Augustine !  
'Tis all over now, I ween !"

But the best of it was that when one held one's fingers in the steam that came out of this pot one could immediately smell what was being cooked on every hearth in the town. Now, that was certainly something very superior to a rose.

And now the Princess came walking along with her ladies-in-waiting, and when she heard the melody she stood still, and was delighted, for she also could play "Ah ! thou darling Augustine !" It was indeed the only tune she knew, but she played it with one finger.

"Yes," she said, "that is the song that I can play. He must indeed be a clever swineherd. Go in and ask him what the instrument costs."

So one of the maids of honour was obliged to

go down into the shed, but she put on pattens first

"What do you want for that pipkin?" asked the maid of honour.

"I want ten kisses from the Princess," said the swineherd

"Good gracious!" said the maid of honour.

"Yes, I will not take less," said the swineherd

"Well, what does he say?" asked the Princess

"I really dare not tell you," said the maid of honour, "it is too frightful!"

"Then whisper it in my ear." So she whispered

"He is very naughty, really!" said the Princess, and turned away at once, but when she had gone a little distance the bells jingled again so sweetly.—

"Ah! thou darling Augustine!

"Tis all over now, I ween!"

"Listen now!" said the Princess, "ask him if he will take ten kisses from my Court ladies"

"No, thank you!" said the swineherd; "ten kisses from the Princess, please, or I shall keep the pipkin!"

"How very tiresome, to be sure!" said the Princess. "Well, then, stand all of you in front of me, so that nobody can see!"

So all the Court ladies made a circle round them, spreading out their dresses, and the swineherd got the ten kisses, and the Princess the pipkin

And now indeed they had a merry time of it. All that evening, and the whole of the next day, the pipkin was kept a-boiling. There was not a hearth in the town but they knew what was being cooked there, whether it was the Lord Chamberlain's or the cobbler's. The Court ladies danced and clapped their hands

"We know who is going to have soup and pancakes for dinner, and who is going to have chops and hasty-pudding. How interesting that is!"

"Most highly interesting!" said the Lady Stewardess of the Household

"Yes, but hold your tongues about it, for I am the Emperor's daughter!"

"Of course, of course!" said they all.✓

The swineherd, that is to say, the Prince—but *they* of course thought he was a real swineherd—let not a day pass without making something or other; and at last he made a rattle, and when one sprang this rattle, one heard all the waltzes, jigs, and polkas that ever were known since the creation of the world.✓

"Why, that is *superbe!*" said the Princess, as she passed by, "I have never heard a finer composition! Listen now! Just go and ask him what the instrument costs. But mind, I will give no more kisses!"

"He wants a hundred kisses from the Princess!" said the maid of honour who had been to ask.

"I think he is mad!" said the Princess, and she went on her way, but when she had gone a little distance she stood still. "After all, one should encourage the fine arts," said she "I am the Emperor's daughter. Tell him he shall have ten kisses as before; he can take the rest from my Court ladies."

"But we do not care about that!" said the Court ladies.

"Fiddlesticks!" said the Princess. "If I can kiss him surely you may. Remember, I give you board and wages!" So the maid of honour had to go to him again.

"A hundred kisses from the Princess," said he, "or everyone keeps his own!"

"Stand around us then!" said the Princess, and so all the Court ladies did as they were bid, and he up and kissed her.

"What is the meaning of all that commotion

by the pigstye yonder ? " asked the Emperor, who had stepped out upon the balcony , and he rubbed his eyes, and put on his spectacles. " Why, if it isn't the Court ladies ! They are playing some sort of game I must go down to them." So he put on his slippers, and pulled them up behind, for they were shoes he had worn down at heel

My goodness ! what a hurry he was in.

As soon as he came into the courtyard, he walked very softly, and the Court ladies had so much to do with counting the kisses, so that it might be a perfectly fair bargain, and the swineherd might not get too many or too few, that they never observed the Emperor.

He raised himself on tiptoe " Why, what's this ? " said he, when he saw them kissing, and with that he beat them about the head with his slipper just as the swineherd had got his six-and-eightieth kiss

" Be off with you, out of my sight ! " said the Emperor, for he was very wrath, and both the Princess and the swineherd were expelled from his domains

There she stood now a-weeping , the swineherd cursed and the rain poured down in torrents.

" Alas ! wretched creature that I am ! " said

the Princess, "if only I had taken that nice Prince! Alas! how miserable I am!"

Then the swineherd slipped behind a tree, wiped all the black and brown from his face, threw away his nasty clothes, and stepped forward in his princely raiment, looking so handsome that the Princess could not but curtsey.

"I have come to scorn you," said he. "You would not have an honest Prince! You could not appreciate roses and nightingales, but you could kiss the swineherd for a trumpery toy! Take it, then, and much good may it do you!"

So he returned to his kingdom, shut the door behind him, and barred and bolted it, and she was left outside to sing —

"Ah! thou darling Augustine!  
'Tis all over now, I ween!"

## THE NIGHTINGALE

IN China you know very well, of course, the Emperor is a Chinaman and all those about him are Chinese also. It happened many years ago, but just for that very reason the story is worth hearing before it is forgotten. The Emperor's palace was the most gorgeous in the world, it was built entirely of the finest porcelain and was very costly, but so brittle that one had always to take particular care not to touch it. In the garden were the most wonderful flowers, and to the most beautiful of them were tied silver bells which rang whenever anybody passed by lest they should miss seeing the flowers. Yes, everything in the Emperor's garden was extremely beautiful, and the garden itself stretched so far that the gardener himself did not know where it ended.

If one walked far in it, one came to the loveliest wood, with lofty trees and deep lakes. The wood ran down to the sea, which was deep and blue, large ships could sail under the branches and in one of these branches dwelt a nightingale which sang so sweetly that even the poor fisherman, who

had many other things to attend to, would stop to listen when he went out at night to drag up his nets. "How beautiful it is!" he said, but then he had to see to other things and so forgot the bird. Yet, next night, when it sang again, and the fisherman came thither, he was sure to say the same thing: "How beautiful it is!" ~~+~~

Travellers came from all parts of the world to see and admire the Emperor's city and the palace and the garden. But when they heard the nightingale they said, "Yes, that is better than all!"

And the travellers when they got home related what they had seen, and the learned wrote many books about the city and the palace and the garden. But they did not forget the nightingale, indeed, they put that first, and those who could write poetry penned the loveliest verses about the nightingale in the wood by the deep blue lake.

These books went the round of the world and some of them in course of time reached the Emperor. He sat on his gold throne and read and read. Every moment he nodded his head, for it pleased him to read the fine descriptions of the city and the palace and the garden. "But when all is said, the nightingale is still the best of all!" said the books.



श्रीमती बाल यशा ने  
प्रस्तुत किया

रुदनगढ़ (राजस्थान)



Why, what is this ? " said the Emperor. " The nightingale ! I do not know of any nightin-gale ! Must one learn such things from books ? This must be looked into "

So he called his lord-in-waiting.

## 30 ANDERSEN'S FAIRY STORIES

"Why, what is this?" said the Emperor—"the nightingale! I do not know of any nightingale! I had no idea there was such a bird in my kingdom, let alone in my very garden! Must one learn such things from books? This must be looked into!"

So he called his lord-in-waiting, who was so very grand that whenever any one lower in rank than himself presumed to speak to him or to ask a question he only answered, "P!" which meant nothing at all.

"There is said to be a very remarkable bird called a Nightingale!" the Emperor informed him; "people declare that it is the finest thing in my vast realm. Why have I not been told about it?"

"I have never heard it so much as mentioned before," replied the lord-in-waiting, "it has never been presented at Court!"

"I command it to come here this very evening and sing to me," said the Emperor "Why, the whole world knows what I possess and yet I don't know it!"

"I never heard the name of it before!" said the lord-in-waiting, "but I will have inquiries made and find it!"

But where was it to be found? The lord-in-

waiting ran up and down all the staircases in the palace and through all the rooms and corridors, but of the people he met not one knew about the nightingale. So the lord-in-waiting came back to the Emperor and said the whole thing must be a fable invented by those who wrote books. "Your Imperial Majesty must not believe what you find written there. It is all invention and something else which they call the Black Art!"

"But the book in which I read this was sent to me by the high and mighty Emperor of Japan," said the Emperor, "and therefore it cannot be an untruth. I wish to hear the nightingale! It must be here this evening! I accord it my most gracious favour! And if it does not come the whole Court shall be trampled on directly it has eaten its supper!"

"Tsing pe!" said the lord-in-waiting, and again he ran up and down all the stairs, through all the rooms and corridors, and half the Court ran with him, for they did not like the idea of being trampled on. There was a universal inquiry about the wonderful nightingale which was known to all the rest of the world but to nobody at Court.

At last they found a poor little girl in the kitchen and she said, "What! the nightingale!

"Little nightingale," cried the scullery-maid loudly, "our gracious Emperor wants you to sing to him so much!"

"With the greatest pleasure!" said the nightingale, and sang so that it was a delight to listen.





Why, I know it quite well! Sing? I should think so! Every evening I take the dinner-leavings to my poor sick mother who lives by the sea-shore, and when I am coming back and am tired and rest in the wood I hear the nightingale sing, and then the tears come into my eyes and it is just as if my mother were kissing me!"

"Little scullery-maid!" said the lord-in-waiting, "I will get you a permanent situation in the kitchen, with permission to see the Emperor eat, if you will lead us to the nightingale, for it is to have an audience this evening."

So they went together to the wood where the nightingale was wont to sing. Half the Court was there. As they picked their way along a cow began to low.

"Oh!" said the lord-in-waiting, "now we have it! That is really a remarkable power for so small an animal! Of course, we have heard it before. We remember it distinctly!"

"No! that is the lowing of the cows!" said the little scullery-maid; "we are still a long way from the place!"

And now the frogs croaked in the marshes.

"Pretty!" said the Chinese court chaplain, "now I hear it; 'tis just like tiny temple bells"

"Nay, those are the frogs!" said the little

scullery-maid, " but I think we shall hear it very soon."

Then the nightingale began to sing.

" That's it ! " said the little girl. " Listen ! listen ! And look ! there it sits " ; and she pointed to a little grey bird in the branches.

" Is it possible ! " said the lord-in-waiting. " I never imagined it was like that ! How very simple it looks ! It is a little off colour, no doubt, at being visited by so many distinguished persons ! " /

" Little nightingale ! " cried the scullery-maid loudly, " our gracious Emperor wants you to sing to him so much ! "

" With the greatest pleasure ! " said the nightingale, and sang so that it was a delight to listen.

" It is like crystal bells ! " said the lord-in-waiting, " and just look how the little throat moves up and down. It is really remarkable. We have never heard it before. It will have a great success at Court ! "

" Shall I sing to the Emperor once more ? " asked the nightingale, for it thought the Emperor was one of the party.

" My excellent little nightingale ! " said the lord-in-waiting, " it is my privilege to invite you to a great entertainment at Court this evening.

where you will enchant his high Imperial Majesty with your charming voice!"

"It sounds best in the green woods," said the nightingale, but it willingly went with them when it heard that the Emperor wished it.

There were grand doings at the palace. The porcelain walls and floor shone with thousands of gold lamps, the loveliest flowers were set up in the corridors, and there was such a running about and such a draught that all the bells rang so much that you could not hear the sound of your own voice. X

In the middle of the large room where the Emperor sat, a golden perch had been placed for the nightingale to sit upon. The whole Court was there and the little scullery-maid had leave to stand behind the door, for she was no longer merely a temporary but a real scullery-maid. Everybody wore their most gorgeous finery and all turned their eyes to the little grey bird when the Emperor nodded to it.

Then the nightingale sang so beautifully that tears came into the Emperor's eyes and trickled right down his cheeks. Presently it sang more beautifully than ever, so that the notes seemed to go to the very heart, and the Emperor was so delighted that he said the nightingale should

The nightingale was now to remain at Court, and to have its own cage and the privilege of walking out twice in the daytime and once at night. It was attended by twelve servants, each of whom tied a silk ribbon round its leg and held on fast. There was not very much enjoyment in such a walk as that!





have his gold slipper to wear round its neck. But the nightingale declined with thanks ; it had been rewarded enough already, it said

“ I have seen tears in the eyes of the Emperor, and that is the most precious treasure to me. An Emperor’s tears have a wonderful power. God knows I have been rewarded enough , ” and it sang again with its sweet, heavenly voice

“ That is the most captivating coquetry we know of , ” said all the ladies who were present, and they put water in their mouths so as to be able to cluck and gurgle when anyone spoke to them. They fancied they, too, were nightingales then , nay, the footmen and waiting-maids themselves said that they were satisfied, and that is a great deal, for they are always the most difficult to please Yes, the nightingale’s success was complete.

It was now to remain at Court, and to have its own cage and the privilege of walking out twice in the daytime and once at night It was attended by twelve servants, each of whom tied a silk ribbon round its leg and held on fast There was not very much enjoyment in such a walk as that ! ~~✓~~

The whole town talked about the remarkable bird and whenever two persons met, one of them

## 42 ANDERSEN'S FAIRY STORIES

immediately said to the other, "Night!" and the other said "gale!" and then they sighed and understood each other, nay, eleven chandlers' children were called after it, but not one of them had a single musical note in his whole composition.

One day a large packet arrived for the Emperor and on the outside of it was written, "The Nightingale!"

"Here now we have a new book about our famous bird!" said the Emperor; but it was not really a book but a little work of art, which lay in a box, an artificial nightingale which had been made to resemble the living one, but was covered all over with diamonds, rubies and sapphires. As soon as you wound up this artificial bird it could sing one of the pieces the real nightingale sang, and then its neck moved up and down and all the gold and silver on it sparkled. Round its neck was a little ribbon and on this was written "The Emperor of Japan's nightingale is poor compared with that of the Emperor of China!"

"That is very pretty!" said they all, and he who had brought the artificial bird immediately received the title of Chief-Imperial-Nightingale-Bringer.

"Now the two must sing together," said the courtiers. "What a duet it will be!"

But it would not do at all, for the real nightingale sang in his own way and the artificial bird went by clockwork. "I have no fault to find with it," said the music master; "it's time is perfect and quite of my school!" So the artificial bird had to sing alone. It was just as successful as the real one and much prettier to look at besides; it glistened like bracelets and breast-pins.

Three and thirty times it sang one and the same piece and yet wasn't tired. The people would have liked to hear it all over again, but the Emperor thought that the living bird ought now to sing a little—but how was this? Nobody had noticed that it had flown out of the open window back to its green woods.

"Did you ever hear of such a thing!" said the Emperor, and all the courtiers stormed and declared that the nightingale was a most ungrateful creature.

"At any rate we have still the best bird," they said, and so the artificial bird had to sing again, and that made the four and thirtieth time they had heard the same piece. But even now they did not know all of it, it was so very difficult. The music master praised the bird above measure, maintaining that it was better than the real

nightingale, not only with regard to its clothes and the many beautiful diamonds but also as to its own merit. <

“ For look now ! your Imperial Majesty, and you also, ladies and gentlemen, as regards the real nightingale you can never tell for certain what will come, but as regards the artificial bird everything is fixed and definite. Thus 'twill be and not otherwise. You can explain all about it. You can open it and display the ingenuity of man. You can see the position of the various parts, how they work and how they follow one after the other ! ”

“ Those are exactly my own thoughts ! ” said all present, and the music master got leave to show the bird to the people on the following Sunday.

“ They also shall hear it sing,” said the Emperor.

And hear it they did and were as pleased as if they had been to a tea party and drunk lots of tea, for that is the proper thing to do in China. They all said, “ Oh ! ” and held up their fore-fingers and nodded ; but the poor fisherman who had heard the real nightingale said, “ It sounds nice enough, but there is something wanting. I know not what ! ”

The real nightingale was banished from the realm.

The artificial bird was placed on a silk cushion close by the Emperor's bed ; all the gifts it had received, both of gold and precious stones, lay round about it, and, as to titles, why, it had risen to be " High-Imperial-Night-Singer " and in rank was No. 1 on the left side, for the Emperor reckoned that side to be the nobler on which the heart lay, and even in an Emperor the heart lies on the left side. And the music master wrote five and twenty volumes about the artificial bird ; his treatise was long and learned and full of the hardest Chinese words, and all the people said they had read and understood it, for otherwise they would have been considered stupid and been trampled upon.

A whole year passed. The Emperor, the Court and all the other Chinese knew by heart every little cluck in the artificial bird's song, but just for that reason they liked it all the better ; they could sing it, too, and they did so. The street-boys sang, " Zee-zee-zee ! kluk-kluk-kluk ! " and the Emperor sang it. Yes, indeed, it was really charming !

But one evening, while the artificial bird was singing its best and the Emperor was lying in bed

listening to it, something inside the bird said "sooop" and something went "muurrrr!" All the wheels ran round and the music stopped. ✗

The Emperor at once sprang out of bed and sent for his physician, but what could *he* do! Then he had the watchmaker fetched and after a good deal of talking and peeping, he put the bird somewhat to rights, but he said they must spare it as much as possible, for the machinery was so worn that it was not possible to supply new works which could be relied upon to go with the music. It was a great grief! Only once a year could the artificial bird be allowed to sing and they were very strict about it even then; but the music master made a little speech full of hard words and said that it was just as good as before, and so it *was* just as good as before.

Five years had now passed and the whole land was bowed down by a great sorrow, for, at heart, they were all devoted to their Emperor, and now he was sick and could not live, it was said. A new Emperor had already been chosen and the people stood in the street and asked the lord-in-waiting how their Emperor was.

"P!" said he and shook his head.

Cold and pale lay the Emperor in his large and gorgeous bed The whole Court thought he was

dead and every one ran to greet the new Emperor, the valets ran away to talk about it, and the palace serving-maids had company to a large coffee-party. Cloth coverings were strewn about the rooms and corridors so that people might walk softly and therefore it was still, oh, so still. But the Emperor was not dead yet; stiff and pale he lay in his gorgeous bed with the long velvet curtains and the heavy gold tassels. High above a window stood open and the moon shone in upon the Emperor and the artificial bird.

The poor Emperor could scarcely breathe; it was as if someone were sitting on his chest. He opened his eyes and saw that it was Death who sat upon his breast and had taken up his gold crown and held in one hand the Emperor's golden sabre and in the other his splendid banner. And round about the folds of the large velvet bed-curtains strange-looking heads peeped forth, some quite ugly and others sweet and gentle; they were the Emperor's good and evil deeds gazing at him now that Death was at his heart.

"Music, music!" cried the Emperor, "the big Chinese drum, that I may not hear what they say!"

But the figures remained and Death nodded, just like a Chinaman.

" Music, music ! " shrieked the Emperor, " you charming little gold bird, sing, sing, pray do ! I have given you gold and precious things, I myself have hung my gold slipper round your neck Sing, I say, sing ! "

But the bird remained silent ; there was none to wind it up and it never sang otherwise. And Death kept on looking at the Emperor, and all was so still, so frightfully still

At that very instant the most beautiful song sounded close by the window. It came from the little living nightingale which sat upon the branch outside. It had heard of the Emperor's sore need and had therefore come to sing hope and comfort to his soul, and as it sang the shapes round the bed grew paler and paler, the blood passed more quickly through the Emperor's weak limbs and Death himself listened and said, " Go on, little nightingale, go on ! "

" Yes ; but will you give me the splendid gold sabre ? Will you give me the rich banner ? Will you give me the Emperor's crown ? "

And Death gave away all these treasures for a song and the nightingale kept on singing. It sang of the silent churchyard where the white roses grow, where the elderberry tree scents the air and where the fresh grass is wet with





One evening, while the artificial bird was singing its best, something inside said "sooop" and something went "muurrrr!" All the wheels ran round and the music stopped. The Emperor at once sprang out of bed and sent for his physician, but what could *he* do!

mourners' tears. Then Death felt a longing for his garden and swept out of the window like a cold white mist.

"Thanks, thanks!" said the Emperor, "you heavenly little bird! I know you well 'Twas you I drove out of my realm and yet you have sung the evil visions away from my bedside! How can I reward you?"

"You *have* rewarded me," said the nightingale "I drew tears from your eyes the first time I sang, that I shall never forget; those are jewels which rejoice a singer's heart. But go to sleep now and get well and strong! I will sing to you!"

As it sang the Emperor fell into a sweet sleep, such a soft, refreshing sleep.

The sun was shining in upon him through all the windows when he awoke, strong and hale. Not one of his servants had yet come back, for they fancied he was dead, but the nightingale still sat and sang.

"You must stay with me always!" said the Emperor; "you shall only sing when you like and I will break the artificial bird into a thousand pieces!"

"Don't do that!" said the nightingale, "after all, it did what *it* could. Keep it as before. For myself, I cannot fix my abode in the palace, but

let me come when I have a mind to and then I will sit on this branch near the window in the evening and sing to you and so make you thoughtful and happy at the same time. I will sing of those who rejoice and of those who suffer. I will sing of the good and the evil which go on around you and yet are hid from you. The little song-bird flies far and wide. He flies to the poor fisherman, to the roof of the husbandman, to every one who is far from you and your Court. I love your heart more than your crown, and yet the crown also has an odour of sanctity about it. I'll come, I'll sing to you—but one thing you *must* promise me!"

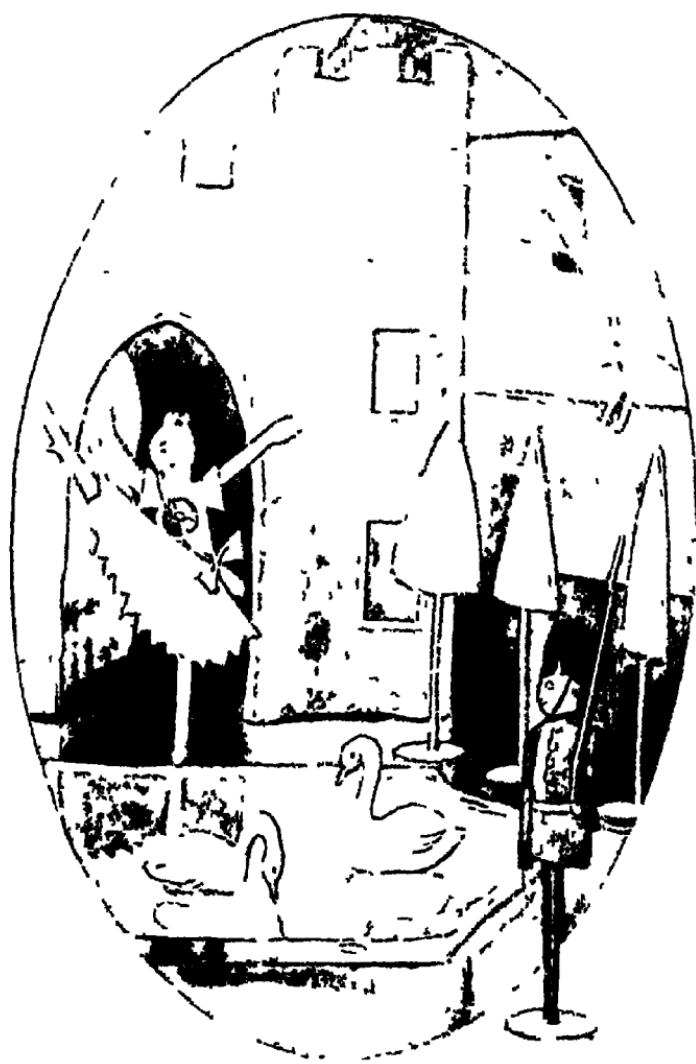
"I'll promise you everything," said the Emperor, and there he stood in his imperial robes, which he had put on himself, and he held his sabre, which was heavy with gold, to his heart.

"One thing I beg of you! Tell no one that you have a little bird which tells you everything and things will be better for you."

And away the nightingale flew.

The servants came in to see their dead Emperor. Yes, there they all stood, and how amazed they were when the Emperor said, "Good morning!"

“That’s the wife for me!” thought the tin soldier.





## THE STEADFAST TIN SOLDIER

**T**HERE were once five-and-twenty tin soldiers, who were all brothers, for they were made out of the same old tin ladle. They shouldered their muskets, looked straight before them, and wore a smart red and blue uniform.

The first thing they heard in this world when the lid was taken off the box in which they lay were the words, "Tin soldiers!" A little boy said that and clapped his hands; they had been given to him because it was his birthday, and he now set them out on the table. Each soldier was the exact image of all the others—at least only one of them was a little different. He had only one leg, for he had been moulded last of all, and there was not tin enough left to give him two legs. Yet he stood as firmly on his one leg as the others did on two legs, and it was just this particular soldier who was to become remarkable.

On the table where they were set out stood a lot of other toys, but what struck the eye most was a pretty paper palace. You could see right into the rooms through the little windows. Outside stood small trees round about a little

mirror which was meant to represent a lake, and wax swans swam on the surface, which reflected back their image. It was all very pretty, but prettiest of all was certainly a little maid who stood at the open palace door, she also was cut out of paper, but she had a skirt of the brightest linen, and a narrow blue ribbon over her shoulders like a scarf, and in the middle of this was a glistening spangle as large as her whole face. The little maid stretched out both her arms, for she was a dancer, and then she lifted one of her legs so high in the air that the tin soldier could not make out what had become of it, and fancied that she had only one leg, like himself ✕

“That’s the wife for me!” thought he, “but she’s a great swell, she lives in a palace, while I have only a box, and there are five-and-twenty of us there, so it is not the place for her! Still I’ll try to make her acquaintance!” So he laid himself at full length behind a snuff-box that happened to be on the table, thence he could peep at the nice little lady who kept on standing on one leg without losing her balance

When it was evening all the other tin soldiers were put back in their box, and the people of the house went to bed. And now the toys began to

play among themselves, they played at visitors, and at warfare, and they had a ball. The tin soldiers rattled in the box, for they wanted to join in the fun, but they could not lift the lid off. The nut-crackers turned somersaults, and the pencil cast up accounts on the slate. There was such a racket that the canary awoke and began to pipe, and in verse too! The only two who did not move from their places, were the tin soldier and the little dancing girl. She remained erect on the tips of her toes, with both arms stretched wide out, he was just as steadfast on his one leg, and never took his eyes off her for an instant.

And now the clock struck twelve, and crack! up flew the lid of the snuff-box, there was no snuff in it, only a little black gnome, for the box was a puzzle.

"Tin soldier," cried the gnome, "will you keep your eyes to yourself?"

But the tin soldier pretended not to hear. "Wait till the morning, that's all!" said the gnome ~~X~~.

Now when it was morning and the children came up to the nursery the tin soldier was placed close to the window, and whether it was the gnome or a draught of air I don't know, but the window all at once flew open, and the soldier

"Have you a pass?" asked the rat "Come out with your pass!"

But the tin soldier kept silence and shouldered arms still more firmly.





fell out, head over heels, from the third storey into the street below. It was a frightful flight. His one leg was right up into the air, and he stood on his helmet with his bayonet sticking in between the flagstones.

The maid-servant and the little boy immediately came downstairs to look for him, but though they very nearly trod upon him they did not see him. If the tin soldier had cried out: "Here am I!" they certainly would have found him, but he did not consider it right and proper to ask for help, because he was in uniform.

And now it began to rain, the drops fell thicker and thicker until it poured. When the shower was over two street-boys came that way.

"Look!" cried one, "there's a tin soldier, let's give him a sail!"

So they made a boat out of a newspaper, put the tin soldier in the middle, and down the gutter he went sailing, while both boys ran along by the side, clapping their hands.

What billows there were in that gutter! And the current too! it was dreadful! Yes, the rain had poored in torrents, and no mistake! The paper boat rocked up and down and spun round and round till the tin soldier was quite dizzy; but he remained steadfast all through, never

changed countenance, looked straight before him, and shouldered arms

All at once the boat went right under a long gutter-coping, it grew as dark as in his box x

"Where on earth am I going now!" thought he; "yes, it is all the gnome's fault. Ah! if only the little dancing maid were sitting here in the boat it might be as dark again if it liked and I should not care!"

The same instant up came a large water rat who lived under the gutter-coping

"Have you a pass?" asked the rat "Come! out with your pass!"

But the tin soldier kept silence and shouldered arms still more firmly

Off went the boat, with the rat close behind it. Ugh! how it gnashed its teeth, crying, "Stop him! stop him! He hasn't paid the toll, and he hasn't shown his pass'!"

But the stream grew stronger and stronger. The tin soldier could already see the bright daylight in front where the coping ended, but he heard at the same time a roaring sound which might well have made even the bravest man afraid. Only fancy! where the coping ended the gutter plunged right down into a large channel, which would be as dangerous to the tin soldier

as sailing down a large waterfall would be to us. He was already so close to the precipice that he could not stand. The boat dashed on, the poor tin soldier stood as stiff as he could, that nobody should say of him that he so much as blinked his eyes. The boat whirled round four times, and filled with water to the very brim. Sink it must! The tin soldier stood up to his neck in water, and deeper and deeper sank the boat, the paper became quite undone; now the water closed right over the soldier's head. Then he thought of the pretty little dancing girl whom he should never see again, and these lines rang in his ear:

"On, soldier! on—on—though swords clash and shots rattle,  
'Tis thy fate to find death in the midst of the battle"

And now the paper burst in the middle, the soldier fell through, and the same instant was swallowed by a huge fish. *X*

How dark it was inside there! Worse even than the gutter-coping; and the space was so narrow too. But the tin soldier remained steadfast, and lay at full length shouldering arms.

The fish frisked about, leaping and darting in the most frightful manner. At last, however, it became still, and what looked like a flash of lightning seemed to dart through it. The light

shone quite brightly, and some one cried aloud: "Tin soldier!"

The fish had been caught, carried to market, sold, and taken to the kitchen, where the maid-servant had cut it open with a large knife. She took the soldier round the waist between her finger and thumb and carried him to the parlour, whither every one hastened to look at the remarkable man who had travelled about inside a fish

Yet the tin soldier was not a bit proud. They placed him on the table, and there—how strangely, to be sure, things come about in this world!—the tin soldier found himself in the self-same room he had been in before; he saw the self-same children, and the same playthings stood upon the table; the beautiful palace with the pretty little dancing girl was there too, and she still stood on one leg and held the other in the air, she, too, was steadfast. The tin soldier was quite touched, he could have shed tin tears, but this would not have become him. He looked at her and she looked at him, but neither said a word.

Then one of the little boys took up the tin soldier and threw him right into the stove. He gave no reason whatever for doing so, no doubt the gnome in the snuff-box was at the bottom of it.

The tin soldier stood lighted up by the flames and felt a frightful heat, but whether it was the actual heat of the fire or the heat of his love he did not know. His bright colours had all faded, but whether in consequence of his journey or of his heartache nobody could say. He looked at the little maid and she looked at him, and he felt in quite a melting mood, but still he stood steadfast and shouldered arms.

Then a door opened, the draught caught the dancing girl, and she fluttered like a sylph right into the stove to the tin soldier, flashed into a flame, and was gone. The tin soldier at the same time melted into a mere lump of metal, and when the serving-maid next day raked the ashes out of the grate she found him in the shape of a little tin heart. Of the dancing girl, all that remained was the spangle, and that was as black as a cinder.

## THE EMPEROR'S NEW CLOTHES

MANY years ago there lived an Emperor who was so fond of new clothes that he spent all his money upon dress and finery. He cared not a straw for his soldiers, nor for going to the theatre or driving in the park ; all he really cared about was showing his new clothes. He had a coat for every hour of the day , and just as in other countries men speak of the “ King in Council,” so here men spoke of the “ Emperor in Wardrobe ”

The great city where he dwelt was a very pleasant place. Many strangers visited it every day, and one day two impostors arrived who gave themselves out for weavers, and pretended they knew how to weave the most beautiful cloth imaginable. Not only were the colours and patterns altogether out of the common, but the clothes made from such cloth had the peculiar property of being invisible to every man who was either unfit for his office or stupid.

“ They would indeed be valuable clothes,” thought the Emperor “ By wearing them, I

could find out which of my ministers are unfit for the posts they occupy, and I could tell the wise from the stupid. Yes; some of that cloth must be woven for me at once." And he gave the two impostors a lot of money in advance so that they might begin their work.

Accordingly they set up two looms and pretended they were working, but there was absolutely nothing upon the looms. Very soon they demanded the finest silk and the purest gold thread, which they put carefully away, and worked on with the empty looms till late into the night.

"I should like to know how the manufacture of the cloth is getting on," thought the Emperor; but really and truly his heart a little misgave him when he remembered that the stupid or the incapable would not be able to see the cloth. He fancied, indeed, that he had no need to be anxious on his own account, but he thought it would be safer to send some one else first to see how things went. Every person throughout the city had heard of the wonderful properties of the new cloth, and all were eager to see how foolish or stupid their neighbours were.

"I will send my worthy old minister to the weavers," thought the Emperor, "he can best see what the cloth looks like, for he is a man of

intellect, and none is fitter for his office than he ”

So the able old minister went into the room where the two impostors sat working at the empty looms. “ Mercy on us ! ” thought he, and opened his eyes very wide “ I can’t see anything.” But he took very good care not to say so

The two impostors begged him to draw nearer, and asked him if the pattern was not a pretty one, and the colours very beautiful Then they pointed at the empty looms, and the poor old minister opened his eyes wider and wider, but he could see nothing, for there was nothing to see. “ Good gracious ! ” thought he, “ I am not stupid, surely ? I never thought so before, and I’ll take good care that nobody shall know it now What ! I am not fit for my office, eh ? Oh, no, it will never do for me to go and say that I can’t see the cloth ! ”

“ Well, have you nothing to say about it ? ” asked one of the weavers

“ Oh, it is beautiful ! absolutely the most lovely thing in the world ! ” said the old minister, and he took out his spectacles “ What a pattern ! And those colours, too ! Yes, I’ll tell the Emperor that it pleases me immensely ! ”

“ Well, we are pleased with it too,” said the two weavers ; and now they named the colours





"Oh, it is very fine," said the Emperor "It has my most gracious approbation!"

And he nodded his head approvingly and gazed at the empty loom.

in detail, and described the pattern. The old minister carefully listened to all they said, so as to be able to repeat the same things to the Emperor, which he accordingly did.

And now the impostors demanded more money, more silk, and more gold, they required the gold for the weaving, they said. They stuck everything into their own pockets; not so much as a thread passed over the looms, but they continued as before to weave upon the empty looms.

In a short time the Emperor sent another very able official to see how the weaving was getting on, and if the cloth was nearly ready. It fared with him as with the minister. He gazed and gazed, but as there was nothing there but the empty loom, he could not contrive to see anything.

"A pretty piece of cloth, isn't it?" said the two impostors, and pretended to point out the pretty patterns, of which there was really no trace.

"Surely I am not stupid!" thought the man. "Not fit for my post, eh! A pretty joke, I must say, but I must not let it be noticed!" So he praised the cloth he did not see, and congratulated them on the beautiful colours and the lovely patterns. "Yes, it is perfectly enchanting!" said he to the Emperor.

Soon all the people in the town were talking of the splendid cloth

And now the Emperor had a mind to see the cloth himself while it was still on the loom. With a host of the great folk of his realm, among whom were the two able officials who had been there before, he went to the two crafty impostors, who were now working with all their might, but without a stitch or thread.

"Now, is it not magnificent?" said the two officials "Will your Majesty deign to observe what patterns, what colours are here?" and they pointed at the empty looms, taking it for granted that the others could see the cloth.

"Why, what is this?" thought the Emperor. "I don't see anything! How horrible! Am I stupid then? Am I unfit to be Emperor? That would be the most frightful thing that could happen to me! Oh, it is very fine!" said he aloud "It has my most gracious approbation!" and he nodded his head approvingly, and gazed at the empty loom. He would not say that he could not see anything. His whole suite stared and stared; they could make no more of it than the rest, but they repeated after the Emperor, "Oh, it is very fine!" and advised him to wear clothes made of this new and gorgeous cloth for

the first time on the occasion of the grand procession which was about to take place

"It is magnificent, elegant, excellent!" went from mouth to mouth. Everybody seemed so mightily pleased with the cloth that the Emperor gave each of the impostors a ribbon and a cross to wear, and conferred on them the title of "Weavers to the Imperial Court"

On the eve of the procession the impostors sat up all night, and had more than sixteen candles lit. The people could see that they were busy getting ready the Emperor's new clothes. They pretended to take the cloth from the loom, they clipped the air with large scissors, and sewed with needles without thread, and at last declared, "There, the clothes are now quite ready!"

The Emperor, with his principal lords, then came himself, and the impostors raised their arms as if they were holding up something, and said, "Look, here are the hose, and here is the coat, and here the mantle. They are as light as gossamer," they continued, "you would fancy you had nothing on at all, but that is just the beauty of the cloth."

"Of course!" said all the gentlemen-in-waiting, but they could see nothing, for there was nothing to see.





" Why ! He has got nothing on ! " cried a little child.

"And now, if your Imperial Majesty would most graciously deign to have your clothes taken off," said the impostors, "we will put on the new ones for your Majesty. In front of the large mirror, please! Thank you!"

So the Emperor's clothes were removed, and the impostors pretended to give him the newly-made ones piece by piece, and they smoothed down his body, and tied something fast which was supposed to be the train, and the Emperor turned and twisted himself in front of the mirror.

"What a capital suit it is! How nicely it fits!" the people cried with one voice. "What a pattern! What colours! It is a splendid dress!"

"The canopy which is to be borne over your Majesty in the procession is waiting outside," the Master of the Ceremonies announced.

"All right," said the Emperor; "I am quite ready. Do my clothes fit well?" He turned himself once more before the mirror, to make believe that he was now taking a general survey of his splendour. The gentlemen-in-waiting, who had to bear his train, fumbled with their hands along the floor as if they were taking the train up, and as they went along they held their hands in the air, for they dared not let it be supposed that they saw nothing.

And thus the Emperor marched in the procession beneath the beautiful canopy, and every one in the streets and in the windows said, "Gracious! how perfect the Emperor's new clothes are! What a beautiful train! How splendidly everything fits!" No one would have it supposed that he saw nothing, for then he would certainly have been unfit for his post, or very stupid. None of the Emperor's clothes had been so successful as these.

"Why, he has got nothing on!" cried a little child.

"Listen to the voice of innocence!" said the father, for every one was whispering to his neighbour what the child had said. "He has nothing on! There is a little child here who says he has nothing on!"

"He really has nothing on!" at length cried the whole crowd.

The Emperor shrank within himself as he heard, for it seemed to him that they were right, but he thought at the same time, "At any rate I must go through with this procession to the end." So he put on a still haughtier air, and the gentlemen-in-waiting marched behind, carefully holding up the train that wasn't there.

82 ANDERSEN'S FAIRY STORIES

The Queen took twenty mattresses, laid them above the pea, and finally on top of the mattresses she put twenty eider-down quilts. There the Princess was to rest that night.





## THE REAL PRINCESS

HERE was once a Prince who was bent upon marrying a Princess, but it was to be a *real* Princess. So he roamed the whole world over to find such a one, but there was always something wrong. Of Princesses there were enough and to spare, but he could not make up his mind as to whether they were *real* Princesses, there was always something that was not quite as he felt it ought to be. So home he came again, and was much distressed, for he absolutely yearned after a real Princess.

One evening there was a terrible storm. It thundered and lightened, the rain poured in torrents—it was positively dreadful! Then there came a knocking at the city gate, and the old King went and opened it.

A Princess stood outside, but oh, what a fright she looked in the rain and wet weather! The water dripped down her hair and clothes, and ran into the tips of her shoes and out again at the heels. Yet she said she was a real Princess.

"Indeed! We'll see about that presently," thought the old Queen. She said nothing, but

## 86 ANDERSEN'S FAIRY STORIES

went into her bedroom, took off all the bed-clothes, and laid a pea at the bottom of the bed. Then she took twenty mattresses, laid them above the pea, and finally on top of the mattresses she put twenty eider-down quilts.

There the Princess was to rest that night.

In the morning the Queen asked her how she had slept.

"Oh, horribly!" said the Princess. "I have scarcely had a wink of sleep all night. Heaven knows what there was in my bed! I have been lying on something hard, for my whole body is black and blue! It is perfectly frightful!"

So they could see at once that this was a real Princess, for she had felt the pea through twenty mattresses and twenty eider-down quilts. No one but a real Princess could have had such delicate feeling as that.

Then the Prince married her, for now he was quite sure she was a real Princess; and the pea was preserved in the cabinet of curiosities, where it may still be seen, if no one has taken it away.

## THE UGLY DUCKLING

**I**T was so pretty out in the country in the glorious summer-time.

The corn stood yellow, the oats green, the hay was stacked in the meadows, and the stork strode about on his long red legs and chattered Egyptian, for he had learnt that language from his mother. Round about the fields and meadows were great forests, and in the midst of the woods deep lakes ; yes, it was truly delightful out in the country !

In the sunlight stood an old country house encircled by deep ditches. From the walls right down to the water grew large dock-leaves that had shot up so high that little children could stand on tiptoe beneath the tallest. It was as lonesome there as in the thickest wood, and here lay a duck upon her nest, she was engaged in hatching her young, but by this time she was nearly tired of the task, it had lasted so long and she seldom received visitors ; the other ducks preferred to swim about in the ditches to waddling up the bank and sitting under a dock-leaf to gossip with her. ✓

At last one egg cracked, and then another and another

"Peep! peep!" was the cry, all the yolks of the eggs had become alive and stuck out their heads.

"Quick! quick!" cried the mother duck; and so they all scampered around as fast as they could and looked about beneath the green leaves, and the mother let them look to their hearts' content, for green is good for the eyes.

"How big the world is, to be sure!" said the young ducklings, for now indeed they had more room to stir about in than when they lay within the egg-shell.

"Do you fancy that this is the whole world?" said their mother, "why, it stretches far beyond the other side of the garden right into the parson's field; but there I have never been. I suppose the whole lot of you are out, eh?" and she rose up. "No, I haven't got you all yet! The biggest egg lies there still. How much longer am I to wait? I am sick and tired of it!" And down she sat again.

"Well, how are things with you?" asked an old duck who came to pay her a visit.

"This last egg takes such a time!" answered the sitting duck, "no hole will come in it! But

just look at the others ! They are the prettiest ducklings I have ever seen ! They are all just like their father, the wretch ! He never comes to see me ! ”

“ Let me see the egg that won’t crack ! ” said the old duck “ Take my word for it, ‘tis a turkey’s egg. I was fooled that way myself once, and the youngsters were a grief and a trouble to me, I can tell you, for they were afraid of the water. I couldn’t get them into it anyhow ! I snapped and quacked, but it was of no use. Let me see the egg, I say ! Yes, it is a turkey’s egg Leave it alone and go and teach the other children to swim ! ”

“ Nay, but I’ll sit on it a bit longer all the same,” said the duck, “ I have sat so long already, I may as well sit a few hours longer.”

“ As you like ! ” said the old duck, and she waddled off

At last the big egg cracked. “ Peep, peep ! ” said the fledgling as it wriggled out—he was so big and ugly. The duck looked at him.

“ What a frightfully big duckling it is ! ” cried she ; “ none of the others is a bit like him ! ” Surely, it can never be a turkey chick ! Well, we shall soon find out about that ! Into the water he goes if I have to kick him in ! ”

Next day it was the most glorious weather ; the sun shone on all the green dock-leaves. The mother duck with all her family came down to the ditch. "Quick ! quick ! " cried she, and one duckling plunged into the water after the other ; the water closed over their heads, but up they came again at once and floated so prettily , their legs went of themselves. The whole lot of them were in ; even the ugly grey fledgling swam along with them.

"No, it is no turkey ! " said the mother duck, "see how nicely it uses its legs, how upright it holds itself ! 'Tis my own youngster ! Now, really, when you come to look closely, it's quite pretty ! Quick ! quick ! Come with me now and I will lead you into the great world and present you to the duck-yard, but always keep close to me so that no one may tread upon you , and beware of the cat ! "

And so they came into the duck-yard There was a frightful noise there, for two families were fighting over an eel's head, and the cat got it after all.       

"Look, that is the way of the world ! " said the duck-mother, and licked her beak, for she would have liked the eel's head herself. "Use your legs," said she, "look smart and nod your necks

at that old duck yonder, for she is the most distinguished person here, she is of Spanish descent, and don't you see she has a red rag tied to her leg! That is the 'greatest distinction any duck can have; it is as much as to say they don't want to get rid of her, and men and beasts are to take note thereof. Quack! quack! Don't turn your feet in! A well-brought-up duckling keeps his feet wide apart like father and mother! Look!—So!—And now thrust out your neck and say 'Quack!'"

They did so, but all the other ducks round about looked at them and said quite loudly, "Just look! Now we shall have all that mob too! As if there were not enough of us here already! And oh, fie! what a fright *that* duckling looks! We won't put up with him, anyhow!" And immediately a duck flew at the big fledgling and bit him in the neck

"Leave him alone, will you!" said the mother; "he's doing no harm"

"Yes, but he is too big and queer!" said the duck who had bitten him, "and so he must be snubbed!"

"You have pretty children, mother!" said the old duck with the rag round her leg. "They are all pretty except one, which hasn't turned out

well at all! I wish you could make him over again!"

"Impossible, your grace!" said the mother of the ducklings, "he is not pretty, but he has a good disposition and swims as nicely as any of the others; I may say even a bit better! I fancy he will grow prettier, or perhaps somewhat smaller, in time. He has lain too long in the egg and therefore he has not got the proper shape!"

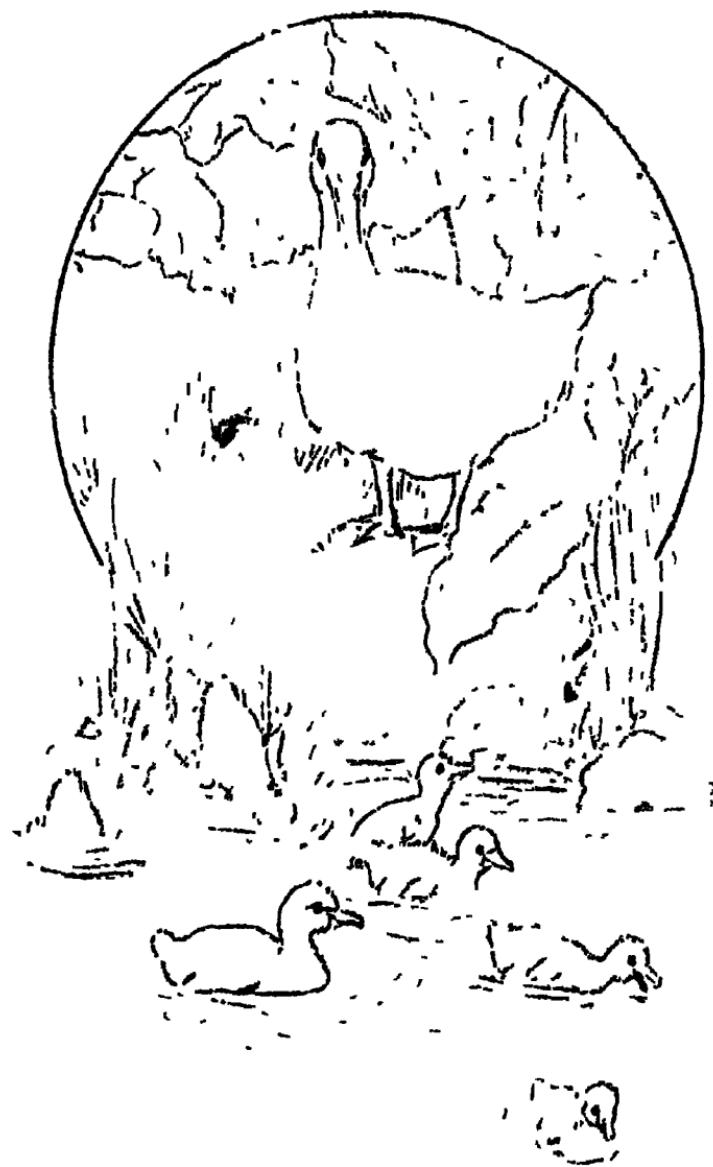
Then she trimmed the ruffled feathers of his neck with her beak and smoothed down the rest of his person. "Besides, he is a drake," she said, "and so it doesn't so much matter! I think he'll be strong enough to fight his way along!"

"The other ducklings are very nice," said the old duck. "Pray make yourself quite at home, and if you find an eel's head you may bring it to me."

And so the family made themselves comfortable.

But the poor duckling who had come out of the egg last of all and looked so ugly, was bitten, pushed about, and made fun of both by the ducks and the hens "He is too big!" they all cried, and the turkey cock, who had been born with spurs, and therefore thought himself an emperor at least, puffed himself out like a ship in full sail,





The whole lot of them were in, even the ugly  
fledgling swam along with them.

pitched into him, and then gabbed till he was red in the face. The poor duckling knew not whether to turn, and was so distressed because he was ugly and the laughing-stock of the whole duck-yard.

Thus it fared with him the first day, and after that things grew worse and worse. The wretched duckling was chivied about by them all. His own brothers and sisters kept saying: "If only the cat would take you, you hideous object!" while even his own mother said, "Would that you were far, far away!" The ducks bit him, the hens pecked him, and the girl who gave the animals their food kicked him.

Then he ran away and flew right over the hedge; the little birds in the bushes were scared and flew into the air. "That is because I am so ugly," said the duckling and closed his eyes. So he ran on till he came to a large fen where the wild ducks dwelt, and there he lay the whole night, weary and sorrowful.

In the morning the wild ducks flew up into the air and saw their new comrade. "What kind of a thing are you?" they asked, and the duckling turned in every direction and greeted them as well as it could.

"You are intensely ugly!" said the wild ducks,

"but it is all the same to us if only you do not marry into the family!"

Poor creature! As if he had any idea of marrying! It was enough for him if he might be allowed to lie among the rushes and drink a little fen water.

There he lay for two whole days, and then there came two wild geese, or rather wild ganders; it was not very long ago since they had come out of the egg-shells, and that was why they were so pert

"Listen, comrade!" said they, "you are so ugly that we have quite taken a fancy to you. Will you scud about with us and become a bird of passage? Close by here, in another fen, are some sweet, delightful wild geese, maiden ladies the whole lot of them, who can say 'Quack!' most charmingly. You'll be able to cut a fine figure there, ugly as you are!"

"Pop! Pop!" sounded the same instant, and the two wild geese fell dead among the rushes, while the water turned blood-red. "Pop! Pop!" sounded again, and whole swarms of wild geese flew up out of the rushes. Then there were fresh bangs. It was a shooting party, the sportsmen lay round about the fen, nay, some even sat up in the branches of the trees which

The children wanted to play with it, but the duckling fancied they meant to hurt it, and in its fright flew right into the milk-can, so that the milk was splashed all about the room,





stretched right over the rushes, the blue smoke went like clouds among the dark trees and hung far over the water, and the hunting dogs came splash-splashing through the mire. Reeds and sedges swayed in every direction, it was a terrible moment for the poor duckling, who turned its head round to put it beneath its wing, and the same instant a frightful big dog stood right in front of it, his tongue hanging far out of his mouth, his eyes shining fearfully, he put his jaws right against the duckling, showed his sharp teeth—and splash! off he went again without seizing it

“Oh, heaven be praised!” sighed the duckling  
“I am so ugly that even the dog doesn’t like to bite me!”

And it lay quite still while the shots hissed among the sedges and gun after gun cracked and banged away.

Only when the day was far advanced and all was still again did the poor duckling dare to get up. It waited many hours longer before it looked about, and then hastened away from the fen as fast as it could. It ran over marsh and meadow, but there was such a wind that it could hardly get along.

Towards evening it reached a broken-down

little cottage. The poor creature was so wretched that it could not make up its mind as to which side it would fall, and so remained standing. It then perceived that the door was off one of its hinges and hung so loosely that it could peep into the room through the crack.

Here dwelt an old woman with her cat and her hen. The cat, whom she called Sonny, could shoot up his back and purr, he could even throw out sparks, but you had to stroke his fur the wrong way first. The hen had stumpy little legs and was therefore called Chicky-short-legs, it laid good eggs and the old woman loved it as if it had been her child.

Next morning they perceived the strange duckling and the cat began to purr and the hen to cluck.

"Well I never!" said the old woman, and looked all about her. But her eyesight was not very good, so she fancied that the duckling was a fat duck which had lost its way. "Why this is a rare good find!" said she, "now perhaps I can have ducks' eggs too. We must wait a bit and see."

So the duckling was taken on trial for three weeks, but not a single egg came to light. The cat was master in that house and the hen was

mistress, and they always said: "We and the world!" for they thought that they were half of the world, and the better half too. The duckling hinted that there might be two opinions on this point, but the hen would not hear of such a thing.

"Can you lay eggs?" she asked.

"No."

"Then hold your tongue!"

And the cat said: "Can you arch your back, purr and throw out sparks?"

"No!"

"Then you have no business to have any opinion at all when sensible people are talking."

So the duckling sat in a corner and was quite out of sorts. Then it thought of the fresh air and the sunshine, and was seized with such a strong desire to float upon the water that at last it could not help saying so to the hen.

"Why, what's the matter with you?" asked the hen. "This comes of being idle. You have nothing to do, and that's why you have all these fancies. Lay eggs or purr, and they'll go away!"

"But it is so nice to float upon the water!" said the duckling; "so nice to take a header and go right down to the bottom!"

"Oh, most delightful, I am sure!" said the hen. "You're mad, I think! Ask the cat; he's

Some little children came running into the garden, they threw corn and breadcrumbs on the water, and the smaller of them exclaimed, "There's a new one!"





the wisest person I know If he likes floating on the water or taking headers, I'll say no more. Ask our mistress, the old woman, there is no one in the whole world wiser than she Do you fancy that *she* has any desire to float on the water and take headers?"

" You don't understand me!" said the duckling.

" If *we* don't understand you, I should like to know who does! You will never be wiser than the cat and the old woman, let alone myself! Don't make a fool of yourself, child, and thank Heaven for all the kindness that has been shown to you Have you not been admitted into a warm room and into company from which you can learn something? But you're a wretch and intercourse with you is anything but pleasant. You may take my word for it. I only mean it for your good when I tell you unpleasant truths. 'Tis only one's real friends who talk to one like that! See that you lay eggs and learn to purr or give out sparks"

" I think I will go out into the wide world," said the duckling

" Do by all means!" said the hen

So the duckling went It floated upon the water, and took headers, but all the other animals looked down upon it because it was so ugly

And now autumn came. The leaves of the forest grew yellow and brown, the wind caught hold of them and made them dance about, and there was a cold look high in the sky. The clouds hung heavy with hail and snowflakes, and on the fence stood the raven and cried, for sheer cold, "Ow! ow!" Yes, the very thought was enough to make one freeze. The poor duckling had anything but a nice time of it.

One evening the sun went down gloriously, and forth from a large grove came a whole flock of lovely large birds. The duckling had never seen anything so beautiful, they were dazzlingly white with long, supple, graceful necks: they were swans. They uttered a strange cry, spread out their splendid wings, and flew away from the cold fields to warmer lands and open lakes. They rose so high, so high, that the ugly little duckling felt quite queer. It turned round in the water like a wheel, stretched its neck after them high in the air, and uttered such a loud and odd shriek that it was frightened at its own voice. Oh! it could not forget the beautiful birds, the happy birds, and as soon as it had lost sight of them altogether, it ducked right down to the bottom, and when it came up again it was quite beside itself. It knew not the name of the birds, or

whether they were flying, yet it loved them as it had never loved anything before. It envied them not one bit. How could it presume to wish for such loveliness! It would have been only too glad if they had suffered it to go with them, the poor ugly creature.

And the winter grew so cold, so cold, the duckling had to keep swimming on the water to prevent it from freezing altogether. But every night the hole in which it swam became smaller and smaller, it froze so that the whole crust of ice crackled again and the duckling had to use its legs continually so that the water might not close up. At last the poor duckling grew faint, lay quite still, and froze fast into the ice.

Early in the morning a farmer came that way, saw the duckling, went out to it, broke the ice with his wooden shoe, and brought the bird home to his wife, and there it revived.

The children wanted to play with it, but the duckling fancied they meant to hurt it, and in its fright flew right into the milkcan, so that the milk was splashed all about the room. The woman shrieked and smote her hands, then it flew into the butter tub, and then down into the meal barrel and out again, by which time it cut a pretty figure, you may be sure. The woman

shrieked and flung the fire-irons at it, the children tumbled over each other's legs in trying to seize it, and laughed and shrieked again. Luckily the door was open, and out it rushed into the freshly fallen snow among the bushes, and there lay as if in a swoon.

But it would really be too heartrending to tell of all the distress and wretchedness the poor duckling had to put up with that hard winter. It was lying in the marsh among the rushes when the sun again began to shine warmly, the larks were singing, it was beautiful spring-time.

One day it extended its wings; they had a stronger beat than before and bore it easily away, and ere it rightly knew where it was, the duckling found itself in a large garden where apple trees stood in full bloom, where the lilac flowers gave forth their perfume and hung on the long green branches right down towards the winding ditches. Oh, it was lovely here, so full of the freshness of spring; and right in front, from out of the thicket, came three beautiful white swans; they made a rushing sound with their wings and floated upon the water. The duckling recognized the splendid creatures and was overcome by a strange feeling of sorrow.

"I will fly towards the royal birds! They

will peck me to death because I, who am so ugly, dare to approach them, but it is all one to me Better to be slain by them than to be nipped by the ducks, pecked by the hens, kicked by the girl who looks after the poultry, and to suffer want in the winter-time! ”

So it flew out into the water, and swam towards the stately swans, who saw it and came darting towards it with bristling plumes “ Kill me and have done with me! ” cried the poor creature, and bowed its head towards the water and awaited death But what did it see in the clear water? Its own image! It was no longer a clumsy, dark grey bird, ugly and clammy, but was itself a swan!

It doesn’t matter a bit about being born in a duck-yard when one has lain in a swan’s egg

The large swans now swam round and round about it and stroked it with their beaks and were quite friendly

Some little children came running into the garden; they threw corn and breadcrumbs on the water, and the smallest of them exclaimed “ There’s a new one! ” The other children also shouted, “ Yes! a new one has come! ” And they clapped their hands and danced about and ran to fetch their father and mother, and bread

and cakes were flung into the water, and they all said : " The new one is the prettiest ! It is so young and lovely ! " And the old swans bowed before it.

It felt so bashful that it stuck its head beneath its wings, it did not know what to do. It was almost too happy but not a bit proud, for a good heart is never proud. It thought of how it had been persecuted and despised, and now all said that it was the loveliest of lovely birds. And the lilacs bowed their branches down into the water towards it, and the sun shone so nice and warm, and then the swan swelled out its plumage, raised its slim neck, and cried from the bottom of its heart : " I never dreamed of such bliss when I was an ugly duckling ! "

## THE FLYING TRUNK

HERE was once a merchant who was so rich that he could have paved the whole street, and a little alley besides, with silver pieces, but he didn't, for he had other things to do with his money. He made a shilling out of every farthing he invested (that's the sort of merchant *he* was!), and then he died.

His son now got all this money and he lived right merrily, went to fancy balls every night, made kites out of bonds and banknotes, and played at ducks and drakes over the water with gold pieces instead of stones, so that his money had leave to go, and go it did, till at last he had nothing in the world but four farthings, a pair of slippers, and an old dressing-gown. Now that he was not fit to be seen in the street with them, his friends washed their hands of him altogether, but one of them, who was better natured, sent him an old trunk, with the message "Pack up!" which was certainly very good advice, but as he had nothing at all to pack up he sat on the trunk instead.

It was a very wonderful trunk. You had only

to press the lock and the trunk set off flying. It did so now. Whisk ! up the chimney it flew with him, high above the clouds, farther and farther and farther still ; it creaked frightfully and the young man was terrified lest it should go to pieces altogether, in which case he would have turned quite a pretty somersault But at last he got to the land of the Turks. He hid the trunk in a wood beneath some dried leaves and then went into the town , there was nothing to prevent him from doing that, for among the Turks everybody went about like himself, in dressing-gowns and slippers

He happened to meet a nurse with a little child “ Listen, thou Turkish nurse ! ” said he, “ what is that large castle close to the town with the windows all so high ? ”

“ That is where the King’s daughter dwells ! ” said she ; “ it has been foretold that she will have great trouble about a lover, and so no woer is allowed to approach her unless the King and Queen come too.”

“ Thank you ! ” said the merchant’s son ; and he went back to the wood, sat on the trunk, flew on to the roof of the castle, and crept through the Princess’s window.

She lay upon a sofa asleep, and was so pretty





It was a very wonderful trunk. You had only to press the lock and the trunk set off flying.

that the merchant's son could not help kissing her. She awoke and was quite frightened, but he said he was the god of the Turks who had come through the air to her, and that seemed to please her. So they sat side by side and he told her tales about her eyes, he said they were like beautiful dark lakes and that thoughts swam in them like so many little mermaids ; and he made up tales about her forehead, which he said was like a snow mountain with the loveliest rooms and pictures ; and he told her about the stork that brings the sweet little children Yes, indeed, very pretty tales they were, so he wooed the Princess and she said "Yes," immediately.

"But," she added, "you must come on Saturday when the King and Queen are here to tea ; they will be very proud for me to have a Turkish god for my husband. But see that you have a really lovely tale ready, for that is what my parents are particularly fond of, my mother likes *her* stories moral and refined, while my father likes them rollicking—things that make one laugh, you know ! "

"Very well, the only bridal gift I shall bring will be a nice tale ! " said he, and so they parted. But the Princess gave him a sabre set with gold

pieces : it was just what he wanted and he could turn it to good account.

So he flew away, bought himself a new dressing-gown, and then sat down in the wood and began composing a tale ; it was to be ready by Saturday, and it is not so easy to compose that sort of thing to order.

But he was ready with it at last, and by that time it was Saturday. The King and Queen and the whole court were having tea with the Princess, and they were all awaiting him. He was received so nicely !

“ And now will you tell us a tale ? ” said the Queen, “ one that is profound and improving ! ”

“ But which will make one laugh as well ! ” said the King

“ Oh, certainly ! ” said he ; and so he told them what you must now listen to very attentively

“ There was once a bundle of matches which were very proud of their descent ; their ancestral tree—that is to say, the great fir-tree of which each one of them was a little splinter—had been a huge old tree in the forest. The matches now lay upon the shelf between a tinder box and an old iron pot, and to these they told the tale of their youth

“ ‘ Yes, when we were on the green branch,’ said they, ‘ then we were indeed happy ! Every morning and evening diamond tea, that is to say, dew Sunshine all day in summer, and all the little birds to tell us stories We could see very well that we, too, were rich, for the leaf trees<sup>1</sup> were only dressed up in summer, but our family had the right to wear clothes both summer and winter. But then came the wood-cutters, that was the great revolution, and our family was felled to the ground The head of the family got a place as main-mast on board a splendid ship, which could sail round the world if it liked, the other branches went elsewhere, and our mission now is to light candles for the common people—that is why we distinguished people have come down to the kitchen.’

“ ‘ Well, things are very different with me ! ’ said the iron pot, by the side of which lay the matches, ‘ ever since I came out in the world I have been scoured and boiled many and many a time I look to solidity, and, properly speaking, am the first person in the house My only joy is to lie neat and clean after dinner on the shelf and to have a sensible chat with my comrades ; but if I except the pail, which occasionally goes down

<sup>1</sup> All trees except the pine and fir species.





The Princess awoke and was quite frightened, but he said he was the god of the Turks who had come through the air to her, and that seemed to please her.

into the garden, we always live indoors. Our only newsmonger is the market-basket, and it is always talking about the Government and the people. Last year there was an old pot with us who was so terrified by this talk that it fell down and dashed itself to pieces. That market-basket is quite a Radical, I can tell you!'

"' You chatter too much, you do! ' said the tinder box, and the steel struck the flint till it sparkled. ' Shall we have a cheerful afternoon now? '

"' Yes, let us talk about who is the most nobly born, ' said the matches.

"' No, I don't like talking about myself, ' said the pot. ' Let us have an entertainment I'll begin. I'll tell about something which every one has experienced; one can imagine one's self in similar circumstances, and that is such capital fun. "By the Baltic Sea, where the Danish beeches grow—"

"' That is a nice beginning, ' said the plates, ' we know we shall like that story.'

"' Yes, there I passed the days of my youth in a quiet family; the furniture was waxed, the floor washed, and we had clean curtains every fortnight.'

"' How interesting you make your story! '

said the hearth-broom. 'One can hear at once that it is a lady who tells the tale ; a vein of such refinement runs through it all.'

"'Yes, one does feel that !' said the pail, and it took a little skip for pure joy, so that the floor creaked.

"So the pot continued its story, and the end was as good as the beginning.

"The plates rattled for joy, and the hearth-brush took some green parsley and crowned the pot, for it knew that that would vex the others. 'And if I crown her to-day,' it thought, 'she will crown me to-morrow'

"'Now I will dance,' said the fire-tongs, and dance it did. How it flung its legs into the air ! the old chair-cover in the corner split its sides at the sight.

"'Let me be crowned too !' said the fire-tongs, and crowned she was.

"'A low lot, a low lot after all !' thought the matches.

"And now the teapot was asked to sing, but she protested that she had a cold and could only sing when she was boiling over, but this was pure pretence ; she would not sing unless she was on the table with the family.

"Right in the window-sill stood an old quill

"And now will you tell us a tale?" said the Queen.

"Oh! certainly," he replied





pen which the maid-servant used to write with ; there was nothing remarkable about it except that it had been dipped a little too deeply into the inkpot, but of that it was proud ' If the teapot won't sing,' it said, ' she may leave it alone. Outside there is a nightingale hanging in a cage, it can sing if you like. It is true it hasn't *learnt* anything, but we won't speak ill of it this evening.'

" ' I consider it very unbecoming that such a foreign bird should be listened to at all,' said the tea-kettle, who was the kitchen songstress and half-sister of the teapot. ' Is it patriotic ? That's what I want to know ! Let the market-basket decide '

" ' All I know is that I am very angry ! ' said the market-basket ; ' nobody can imagine how angry I am ! Is this a proper way of passing the evening, I ask ? Would it not be much better to put the house to rights first ? Every one would then get his proper place, and I should rule the whole roost. Things would be very different then ! '

" ' Yes, let us kick up a row ! ' said they all. The same instant the door opened It was the maid-servant, and they immediately stood stock-still, no one uttered a sound. But there was

The merchant's son bought rockets, crackers, and every sort of firework you can think of, put them in his trunk and then flew up into the air. How they went off and how they fizzed! The Turks all skipped into the air at the sight, so that their slippers flew about their ears; such a shower of meteors they had never seen before.



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not a pot there which did not know very well what it could do and how distinguished it really was 'Yes, if only I had liked,' thought each one of them, 'what a jolly afternoon we should have had !'

"The maid-servant took the matches and struck a light with them ; how they spluttered and burst into flame, to be sure ! 'Now every one can see,' thought they, 'that we stand first of all ! What light, what splendour is ours !' and so they burned right out "

"That was a beautiful story ! " said the Queen "I so entered into the feelings of the matches in the kitchen Yes, now you shall have our daughter."

"Yes, certainly," said the King, "you shall have our daughter on Monday ! " And they spoke to him in such a friendly way that he felt he was already one of the family

So the wedding-day was fixed The evening before the whole city was illuminated , buns and cakes were scattered broadcast, and the street-boys stood on their heads, whistled through their fingers, and cried "Hurrah ! " It was truly magnificent

"Yes, I must take good care to do something

likewise!" thought the merchant's son. So he bought rockets, crackers, and every sort of fire-work you can think of, put them in his trunk and then flew up into the air. How they went off and how they fizzed! The Turks all skipped into the air at the sight, so that their slippers flew about their ears; such a shower of meteors they had never seen before. Now they could well understand that it was the god of the Turks himself who was to marry the Princess.

As soon as the merchant's son came down again into the wood with his trunk he thought. "I will just go into the town to learn how the affair went off!" And it was only natural that he should wish to do so.

Every one whom he asked about it had seen the affair in his own way, but one and all thought it charming.

"I saw the god of the Turks himself," said one; "he had eyes like shining stars and a beard like foaming water."

"He flew in a fiery mantle," said another; "the loveliest little angels peeped forth from the folds of it."

Yes, he heard the most beautiful things about himself, and the day after he was to be married.

And now he went back to the wood to sit on

his trunk—but where was it? The trunk was burnt! A spark from the fireworks had remained within, the trunk had caught fire, and was now nothing but ashes. He could fly no more, nor go to meet his bride

She stood all day on the roof and waited, and most likely she is still waiting, but he goes round about the world and tells stories, but they are no longer as merry as the story he told about the matches

## THUMBELISA

**T**HERE was once a woman who wanted very much to have a wee little child, but had no idea whatever where she should find one. So she went to an old witch and said to her—

“ I do so long to have a little child ; will you tell me where I can get one ? ”

“ We'll soon get over that difficulty ! ” said the witch. “ Here is a barley-corn ; it is not at all the sort which grows in the farmer's fields, or that fowls are given to eat. Put it in a flower-pot and you'll see something, I promise you ”

“ Thank you,” said the woman, and she gave the witch twelve silver pennies, went home, and planted the barley-corn. Immediately a beautiful flower grew up which looked just like a tulip, but the leaves were all folded tightly together as if it were still budding

“ That's a pretty flower ! ” said the woman ; and she kissed the lovely red and yellow petals. At that very moment the flower gave a loud crack and opened. It was a real tulip, any-one could see that, but right in the middle of





One night, as Thumbelisa lay in her pretty walnut-shell cradle, an ugly old toad came hopping through a broken pane in the window. The toad was big and wet, and it hopped right on to the table where Thumbelisa lay sleeping.

“She would make a very nice wife for my son,” said the toad.

the flower sat a wee little girl, so nice and fine. She was only a thumb long, so they called her Thumbelisa.

She was given a splendidly polished walnut-shell for her cradle, she lay upon blue violet-leaves, and had a roseleaf for her counterpane. There she slept at night, but in the day-time she played on the table, where the woman put a plate surrounded with a wreath of flowers with their stalks in the water ; here a large tulip leaf floated, and on this leaf Thumbelisa used to sail from one end of the plate to the other ; she had two white horse-hairs to row with. It was such a pretty sight ! She could sing too, nicely and softly ; never had the like been heard before.

One night, as she lay in her pretty cradle, an ugly old toad came hopping through a broken pane in the window. The toad was big and wet, and it hopped right on to the table where Thumbelisa lay sleeping beneath the red roseleaf.

"She would make a very nice wife for my son," said the toad ; and with that she took up the walnut-shell in which Thumbelisa lay and hopped away through the broken pane out into the garden. A large broad river ran there, but close by the bank it was all swampy and muddy,





A big cockchafer came flying along , he caught sight of Thumbelisa and instantly put his claw around her dainty waist and flew up into a tree with her.

and there the toad and her son lived together. Ugh ! he, too, was nasty and ugly, like his mother.

“ Koax-koax-brekke-ke-kex ! ” that was all he could say when he saw the pretty little girl in the walnut-shell

“ Don’t chatter so loudly or you’ll wake her ! ” said the old toad ; “ she could give us the slip even now, for she is as light as swan’s down. We’ll put her out in the river, on one of the broad water-lily leaves ; she is so light and little that it will be quite an island to her. She can’t escape from there while we are getting the state-room under the mud ready, where you are to live and keep house.”

Out in the river grew many clumps of water-lilies with broad, green leaves, that looked as if they were floating on the surface of the water ; the leaf which was farthest out was also the largest ; the old toad swam out to it, and placed Thumbelisa, nut-shell and all, on top of it.

The poor little creature awoke quite early in the morning, and when she saw where she was, she began to cry bitterly, for there was water on every side of the big green leaf, and she could not get ashore anyhow. The old toad was busy down in the mud, decking her room with rushes

and yellow sedges, for she was determined that her new daughter-in-law should find it nice and tidy. After that she swam out with her ugly son to the leaf where Thumbelisa sat, they wanted to fetch away her pretty bed, as it was to be put into the bridal-chamber before the bride herself arrived.

The old toad bowed low in the water and said, "Let me introduce my son; he is to be your husband, and you will live together pleasantly down in the mud."

"Koax-koax-brekke-ke-kex!" was all the son could say for himself.

So they took the pretty little cradle and swam away with it; but Thumbelisa sat alone on the green leaf and cried, for she did not want to live in the nasty toad's house, nor to have her ugly son for a husband. Now, the little fishes who were swimming in the water had seen the toad and heard what she said, and they stuck their heads up to see the little girl. And directly they caught sight of her they thought her so pretty that they were quite angry at the idea of her going to live with the ugly toad. No, that should never be. So they swam around the green stem of the lily-leaf below the water and gnawed it quite through. So the leaf floated away down the river with

The mole came and paid them a visit in his rich  
black fur coat.





Thumbelisa—far, far away, where the toad could not come

Thumbelisa sailed past a lot of places and the little birds in the bushes looked at her and sang, “What a sweet little girl!” On floated the leaf, farther and farther away, and thus little Thumbelisa went abroad on her travels.

A pretty little white butterfly hovered over her, and at last it settled on the leaf, for it had taken quite a fancy to Thumbelisa. She was happy, for now the toad could not get at her, and as she sailed along the sun shone on the water like glistening gold and everything was very pretty. She took off her girdle and tied one end of it round the butterfly, and the other end she fastened to the leaf; so now it glided along more quickly than ever.

Presently a big cockchafer came flying along, he caught sight of her and instantly put his claw round her dainty waist and flew up into a tree with her. But the green leaf went sailing down the river and the butterfly with it, for he was fastened to the leaf and could not get away.

Gracious! how frightened, to be sure, was poor little Thumbelisa when the cockchafer flew up into the tree with her. But she was anxious most of all about the poor white butterfly which

she had tied fast to the leaf ; if he could not get loose, he must surely starve to death ! But the cockchafer did not trouble himself about that at all. He sat down with her on the largest green leaf in the tree, gave her some honey from the flowers to eat, and told her that she was very pretty, although she did not resemble a cockchafer in the least.

After that the other cockchafers who lived in the tree came and paid them a visit ; they looked at Thumbelisa, and shrugged their feelers and said, " Why, she has only two legs ; what a fright she looks ! " " She has no feelers at all," they went on, " just look how slender her waist is ! Fie ! she looks just like a human being ! How ugly she is ! "

All the lady cockchafers said this, and yet Thumbelisa was pretty after all. The cockchafer who had run off with her thought so too, but as all the others said she was ugly, he got at last to believe she really was so, and would have nothing more to do with her , she might go where she liked, he said.

They flew down from the tree with her and placed her on a daisy ; there she sat and cried because she was so ugly that even the cockchafers would have nothing to do with her. And yet

she was the loveliest little thing you can imagine, as fine and delicate as the most beautiful rose-leaf.

All through the summer poor Thumbleisa lived alone in the forest. She plaited herself a bed of grass-stalks and hung it up under a large dock-leaf so that the rain could not fall upon her, she gathered honey from the flowers for her food, and drank the dew which lay fresh every morning on the leaves. Thus summer and autumn passed away; but now winter had come, the long, cold winter. All the birds that had sung so prettily flew away, the flowers withered, the trees shed their leaves, the large dock-leaf she had lived under shrivelled up and became a yellow, withered stalk, and she felt horribly cold, for her clothes were in rags and she herself was so small and delicate that she was bound to freeze to death. Poor little Thumbleisa! And now it began to snow, and every snowflake which fell upon her was just as if one were to cast a whole spadeful of snow upon one of us, for we are big and she was but a thumb long. She wrapped herself up in a withered leaf, but it did not warm her at all and she shivered with cold.

Close to the wood was a large corn-field, but the corn had long since been cut and carried

As soon as the spring came and the sun had warmed the earth, the swallow said good-bye to Thumbelisa.





away, only the bare, dry stubble stood up on the frozen ground. To her indeed it was just like another great wood, oh, how she shivered as she went through it! And thus she came to the field-mouse's door. It was a little hole right under the stubble. There dwelt the field-mouse, quite warm and cosy; she had a whole room full of corn, and a nice kitchen and larder. Poor Thumbelisa stood outside the door, like a beggar-girl, and begged for a little barley-corn, for she had not had anything to eat for two days.

"You poor little creature!" said the field-mouse, for, at bottom, it was a kind-hearted field-mouse, "come into my warm room and dine with me!"

Afterwards, as she thought well of Thumbelisa, she said, "You are quite welcome to stay with me all the winter, but you must keep my room nice and clean and tell me stories, for I am very fond of stories".

Thumbelisa did all the good old mouse required of her, and had a very nice time of it.

"We shall soon be having a visitor," said the field-mouse one day; "my neighbour always visits me once a week. He is better housed even than I am, for he has vast halls and goes about in a beautiful black fur coat, if only you could

have him for a husband, you would be well provided for, but unfortunately he cannot see. Now mind, tell him the very prettiest stories you know ”

But Thumbelisa did not trouble her head about it at all, for she knew who the neighbour was—he was only a mole. So he came and paid them a visit in his rich black fur coat ; he was very rich and learned, said the field-mouse, his house moreover was ten times as large as hers ; but he absolutely could not endure the sun and the pretty flowers , having never seen them, he spoke slightly of them.

Thumbelisa had to sing to him, and she sang “ Fly away, Cockchafer ! ” and “ The Blackcap trips the meadow along.” The mole fell in love with her because of her sweet voice, but he said nothing at the time, for he was a very discreet person

He had recently dug himself a long passage under the earth from his own house to theirs, and he gave the field-mouse and Thumbelisa permission to walk in it whenever they liked. At the same time he told them not to be frightened at the dead bird which lay in the passage ; it was a whole bird with feathers and beak complete, which certainly must have died quite recently,

when the winter began, and had been buried just where he was making his passage

The mole took a piece of touchwood in his mouth, for it shines like fire in the dark, and went in front to light them through the long, dark passage. When they came to the dead bird, the mole put his broad nose through the earth above till there was a large hole. Through this the light shone on the body of a dead swallow, with its pretty wings folded down to its sides, and its head and legs drawn in beneath its feathers, the poor bird had certainly died of cold.

Thumbelisa was very sorry for it, she was fond of all little birds, had they not sung and twittered for her so prettily all through the summer? But the mole gave a kick at it with his short legs and said, "It will chirp no more now. How miserable it must be to be born a little bird! Thank Heaven, none of my children will be *that!* Birds like that have nothing in the world but their 'Kwee-wit! Kwee-wit!' and must starve to death in the winter, stupid things!"

"You may well say that, sensible creature as you are," remarked the field-mouse. "What has a bird to show for itself when the winter comes, for all its 'Kwee-witting'? It must starve and freeze to death! very romantic, I daresay!"

Thumbelisa said nothing, but when the other two had turned their backs on the dead bird, she bent down over it, brushed aside the feathers which lay over its head, and kissed its closed eyes. "Perhaps it was this very one which sang so prettily to me in the summer," she thought; "what joy it gave me, the lovely, darling bird!"

The mole now stopped up the hole through which the daylight shone and escorted the ladies home. But at night Thumbelisa could not sleep, so she rose from her bed, plaited a large and pretty rug of hay, and took it down with her and spread it round the dead bird, laying some soft wool, which she had found in the field-mouse's room, at the sides of the bird, that it might lie warm on the cold earth.

"Farewell, you pretty little bird!" said she, "farewell, and thank you for your pretty songs in the summer-time, when all the trees were green and the sun shone so warmly upon us!"

Then she laid her head on the bird's breast, but was very much startled, for it was just as if something inside was going "Thump! thump!" It was the bird's heart. The bird was not really dead, it had been in a swoon, and when the warmth stole over it life began to return. In the autumn the swallows fly away to warmer lands,

but if there be one that is late and gets left behind, it gets so cold that it falls down as if dead, and the cold snow comes and buries it

Thumbelisa trembled, so frightened was she for really the bird was a big creature, compared with herself, but she plucked up her courage, wrapped the cotton-wool more closely round the poor swallow, and brought a leaf, which had served her as a counterpane, and placed it over the bird's head.

The following night she again crept down to it, and there it was quite alive, but so weak that it could only open its eye for a second and look at Thumbelisa, who stood there with a little piece of touchwood in her hand, for she had no other light.

"Many thanks, you pretty little child!" said the sick swallow. "I am so nice and warm now I shall soon get back my strength, and be able to fly away into the warm sunshine"

"Oh, not yet!" said she, "it is so cold outside, it is snowing and freezing! Keep in your warm bed, and I will nurse you!" She brought the swallow water in a leaf, and when it had drunk it told her how it had torn one of its wings on a thorn bush, and therefore could not fly so strongly as the other swallows, when they flew away to

the warm lands. Then it had fallen to the ground, but it could not remember anything more, and did not know in the least how it had got there.

The swallow stayed the whole winter, and Thumbelisa was kind to it and loved it very much. Neither the mole nor the field-mouse was told a word about it, for Thumbelisa knew they did not like birds.

As soon as the spring came and the sun had warmed the earth, the swallow said good-bye to Thumbelisa, who opened the hole which the mole had made in the ground. The sun then shone in gloriously, and the swallow asked if she would not go with him ; she could sit on his back and they would fly far out into the green wood. But Thumbelisa knew that it would grieve the old field-mouse if she left her like that.

"No, I cannot come," said Thumbelisa.

"Good-bye, good-bye ! you good, pretty little girl !" said the swallow, and flew out into the warm sunshine. Thumbelisa looked after it, and the tears came to her eyes, for she dearly loved the swallow.

"Kwee-wit ! Kwee-wit !" sang the bird, and flew away into the green wood. Thumbelisa was very sorrowful. She could not get leave anyhow

to go into the warm sunshine, the corn which had been sown in the field over the field-mouse's house had grown high in the air, and seemed like a thick wood to the poor little girl who was only a thumb long.

"This summer you must sew away at your *trousseau*," said the field-mouse, for by this time their neighbour, the tiresome mole, had made up his mind that he wanted her to be his wife. "You must have both linen and woollen in your wardrobe, for when you become the mole's bride you must sit down in the best and lie down in the best also."

So Thumbelisa had to spin away at her distaff, and the field-mouse hired four spiders to weave for her night and day. Every evening the mole paid them a visit, and he always talked about the same thing, and said that when the summer came to an end the sun would not be so hot, as it was it baked the earth as hard as a stone. Yes, and when the summer was over the wedding with Thumbelisa was to take place, but she did not like that at all, for she could not bear the tiresome mole.

Every morning when the sun arose, and every evening when it set, she crept out of doors, and when the wind parted the tops of the corn, so

that she could see the blue sky, she thought how beautiful it was in the light, and longed to see the dear swallow once more. But it never came back, it must certainly have flown far away into the greenwood.

When autumn came Thumbelisa's outfit was quite ready.

"In four weeks you shall be wedded," said the field-mouse. But Thumbelisa began to cry, and said that she could not marry the tiresome mole.

"Fiddlesticks!" said the field-mouse; "don't be obstinate, or I shall bite you with my white teeth. Such a handsome husband as you're going to have too! what more do you want? The Queen herself has not the like of his black fur coat. He has lots too in both kitchen and cellar. Be thankful for such a husband, say I!"

And so they were to be married. The mole had already come to fetch Thumbelisa away; she was to live with him deep down in the ground, and never come up into the warm sunlight at all, for he could not bear it. The poor child was so distressed, but she obtained leave to bid the beautiful sun farewell, for while she had lived with the field-mouse she had always been allowed to look at the sun from the door anyhow.

"Farewell, dear, golden sun!" she said, and





MW 1

Thumbelisa had to spin away at her distaff, and the field-mouse hired four spiders to weave for her night and day.

stretched her arms high in the air, even going a little way beyond the field-mouse's door, for the corn had been reaped, and only dry stubble stood there now "Farewell, farewell!" cried she, and threw her tiny arms round a little scarlet flower which grew there. "Greet the dear swallow from me if you ever see him!"

"Kwee-wit! Kwee-wit!" sounded at that very moment high above her head. She looked up. It was the swallow just passing by. As soon as he saw Thumbelisa he was delighted. She told him how she disliked the idea of having the nasty mole for a husband, and having to live with him deep down under ground where the sun never shone. She could not keep back her tears as she told him

"The cold winter is coming now," said the swallow; "I am going to fly far away to the warm lands. Will you come with me? You can sit upon my back. You have only to tie yourself fast on with your girdle, and then we will fly right away from the ugly mole and his dark room, right over the mountains to the warm lands where the sun shines lovelier than here, and where there is always summer. Do, pray, fly away with me, you sweet little Thumbelisa, who

saved my life when I lay frozen in the dark earthy cellar!"

"Yes, I'll go with you," said Thumbelisa gladly. She sat on the bird's back, her feet resting on its outspread wings, tied her belt fast to one of its strongest feathers, and then the swallow flew high into the air, over wood and over sea, and high up over the big mountains where snow always lies. Thumbelisa was almost frozen in the cold air, but she crept right in under the bird's warm feathers, only peeping out now and then to see all the beautiful things beneath her.

At last they came to the warm lands. There the sun shone much more brightly, the sky was twice as high, and in hedge and field grew the loveliest green and blue grapes. In the woods hung lemons and oranges, there was a fragrance of balsam and myrtle, and along the roads ran lovely children playing with large speckled butterflies. But the swallow flew still farther, and everything became lovelier and grander. Beneath stately green trees near a blue lake stood a dazzlingly white marble palace from the olden times. Vine tendrils twined up and around the high pillars, and up at the very top were a number of swallow-nests, in one of those dwelt the swallow who had carried Thumbelisa.

"Here is my house," said the swallow, "but pray choose one of the most splendid of the flowers that grow, and I'll put you there and you shall have as happy a time as you can desire."

"Oh, that will be lovely!" cried she, clapping her tiny hands.

On the ground lay a large white marble column which had fallen and broken into three pieces, and between them grew the loveliest white flowers. The swallow flew down with Thumbelisa and placed her on one of the broad leaves; but how amazed was she when she saw a little elf sitting in the very centre of the flower, as white and transparent as if he were of glass! He had on his head a tiny gold crown and bright wings on his shoulders, and he was scarcely any bigger than Thumbelisa. He was the elf of the flower. In every flower there lived some such little man or woman, but he was the King of all

"How handsome he is!" whispered Thumbelisa to the swallow.

The little prince was quite frightened at the swallow, for to him it was a gigantic bird, but when he saw Thumbelisa he was delighted, she was the very prettiest girl he had ever seen. He took his gold crown from his head and put it on hers, asking her name and begging her to be his





At the wedding every one brought Thumbelisa  
a present

wife, for then she would be the Queen of the flowers !

Now, this was something like a husband, and very different from the son of a toad, or a mole in his black fur coat. So she said " Yes " to the pretty prince, and from every flower came forth a lord or a lady elf, all so graceful that it was a joy to behold them. At the wedding everyone brought Thumbelisa a present, but the best of all was a pair of pretty wings from a large white fly , they were fastened on to Thumbelisa's back, so that she could fly from flower to flower. There was a great merry-making, and the swallow sat overhead in his nest and sang to them as well as he could, but at heart he was distressed, for he loved Thumbelisa and would have liked to be with her always.

" Farewell, farewell ! " sang the swallow, a little later, and flew away again from the warm land—far, far away back to Denmark. There it has a little nest over the window of the man who tells fairy tales, and it sang to him, " Kwee-wit ! Kwee-wit ! " And that is how we got this story.

## THE LITTLE MERMAID

Far out at sea the water is as blue as the loveliest cornflower and as clear as the purest crystal. But it is very deep—deeper than anchor ever yet reached, many church towers would have to be piled one upon the other to reach right up from the bottom to the surface. Down there dwell the Sea-folk.

Now you must by no means fancy that there is nothing there but a bare white sandbank. No, indeed! The most wondrous trees and plants grow there, the stalks and leaves of which are so supple that they wave to and fro at the least motion of the water, just as if they were living beings. All the fishes, small and great, glide among the branches just as the birds fly about the trees up here. In the deepest spot of all lies the Sea-King's palace. The walls are of coral and the tall, pointed windows of the clearest amber, while the roof is of mussel-shells, which open and shut according to the tide; and lovely they look, for in every one of the shells lies a glistening pearl, any of which would be the glory of a Queen's crown.

All she would have to adorn her garden, besides the rosy-red flowers which resembled the sun, was a pretty statue of a handsome boy which had sunk to the bottom of the sea during a shipwreck.





The Sea-King had been a widower for many years, so his aged mother kept house for him. She was a wise woman and very proud of her noble birth, by reason of which she always went about with twelve oysters on her tail, the other important folk being only allowed to wear six. Nevertheless she was very well-esteemed, especially because of the loving care she took of the little sea-princesses, her granddaughters. They were six pretty children, but the youngest was the loveliest of them all. Her skin was as delicately tinted as a rose-leaf, and her eyes were as blue as the deepest sea, but, like all the others, she had no feet, her body ending in a fish's tail.

All day they used to play in the great rooms of the palace, where living flowers grew upon the walls. When the large amber windows were opened the fishes would swim into them just as the swallows fly into our houses when we open the windows; only the fishes swam right up to the little princesses, ate out of their hands, and let themselves be patted.

Around the palace was a large garden full of bright red and dark blue trees, the fruit shone like gold, and the flowers like burning fire, as the stalks and leaves moved to and fro. The soil itself was the finest sand, but blue as sulphur-

flames. A wondrous blue tint lay over everything, one would be more inclined to fancy that one was high up in the air and saw nothing but sky above and below than that one was at the bottom of the sea. During a calm, too, one could catch a glimpse of the sun; it looked like a crimson flower from the cup of which light streamed forth.

Each of the little princesses had her own garden-plot where she could dig and plant as she pleased. One gave her flower-plot the form of a whale, another preferred hers to look like a little mermaid; but the youngest planted hers in a circle to imitate the sun and would only have flowers which shone red like it. She was a strange child, silent and thoughtful, and while her sisters delighted to adorn their gardens with all the strangest things they could get from wrecked vessels, all that she would have, besides the rosy-red flowers which resembled the sun, was a pretty statue of a handsome boy, hewn out of pure white marble, which had sunk to the bottom of the sea during a shipwreck. She planted by this statue a rosy-red weeping willow; it grew splendidly and its fresh branches hung over the statue, nearly down to the sandy bottom where the shadows took a violet hue and moved to and fro

like the branches. It seemed as if the top of the tree were at play with its roots, each trying to snatch kisses

Her greatest joy was to hear about the world of mankind above. She made her old grandmother tell her all she knew about ships and towns, people and animals. What struck her as specially wonderful was that the flowers which grew upon the earth should give forth fragrance, which they did *not* do at the bottom of the sea, and that the woods were green and that the fishes among the branches could sing so loudly and beautifully that it was a joy to listen to them. It was the little birds that her grandmother called *fishes*, her listeners would not otherwise have understood her, for they had never seen birds.

"When you have reached your fifteenth year," said the grandmother, "you shall have leave to rise up out of the sea and sit in the moonshine on the rocks and see the big ships sail by, woods and cities you shall also see."

In the following year one of the sisters would be fifteen years old, but how about the others? Each was a year younger than the one before, so the youngest would have to wait five whole years before it would be her turn to come up from the bottom of the sea and see what our world is like.

But each promised to tell the others what she had seen and what she had thought the most remarkable on the first day; for their grandmother did not tell them half enough, and there were many things they wanted to know about.

But none of them were so full of longing as the youngest, just the one who had the longest to wait and was so silent and thoughtful. Many a time she stood at the open window and looked up through the dark blue water where the fishes dashed about with their fins and tails. She could see the moon and stars; of course, they shone quite faintly, but at the same time they looked twice as large through the water as they look to us. When something like a dark cloud glided across, she knew that it was either a whale swimming overhead, or else a ship with many people on board, who certainly never dreamt that a pretty little mermaid stood below and stretched her white arms up towards the keel of their vessel.

And now the eldest princess was fifteen years old and might rise to the surface of the sea. When she came back she had hundreds of things to tell about, but the nicest of all, she said, was to lie in the moonshine on a sandbank in the calm sea, and to see close by the shore the large town

where the lights were twinkling, like hundreds of stars, to hear the music and the noise and bustle of carts and men, to look at the many church towers and spires, and to hear the bells ringing. It was just because she could not go ashore that she longed so for all these things.

Oh! how the youngest sister listened. And afterwards, when she stood in the evening at the open window, and looked up through the dark blue water, she thought of the great city with all its noise and bustle, and even fancied she heard the church bells ringing.

The next year the second sister had leave to mount up through the water and swim where she pleased. She rose just as the sun was going down and she thought the sunset the prettiest sight of all. The whole sky looked like gold, she said, and the beauty of the clouds was beyond description. Red and violet, they had sailed right over her, but far quicker than they, a flock of wild swans had flown, like a long white veil, right over the place where the sun stood. She also swam towards the sun, but it sank, and the rosy gleam left behind was soon swallowed up by the sea and the clouds.

A year after that the third sister came up to the surface. She was the boldest of them all, so

she swam up a broad river which ran into the sea. She saw pretty green hillocks covered with vines ; castles and country houses peeped forth from lovely woods ; she heard the birds singing, and the sun shone so that she frequently had to duck down under the water to cool her burning face. In a little creek she came upon a whole swarm of human children ; they were running about quite naked and splashing in the water. She wanted to play with them but they ran away in terror, and a little black beast came up. It was a dog, but she had never seen a dog before ; it barked so savagely at her that she was frightened and sought the open sea again. But never could she forget the lovely woods, the green hills and the pretty children who could swim in the water although they had no fishes' tails.

The fourth sister was not so bold. She remained out in the middle of the sea and said that was nicest of all ; for you could see for miles and miles around, and the sky above looked like a large glass bell. Ships she had seen too, but far away, and they looked like sea-mews ; the merry dolphins had turned somersaults and the great whales had squirted water up through their nostrils, so that it seemed as if hundreds of fountains were playing all round.

And now came the turn of the fifth sister. Her birthday was in the winter, and therefore she saw what the others had not seen the first time they went up. The sea had quite a green colour and round about floated huge icebergs; each looked like a pearl, she said, and yet was far larger than the church towers which human beings built. They had the strangest shapes and glittered like diamonds. She had placed herself on one of the largest, and all the vessels had scuttled past in terror while she sat there and let the wind flutter her long streaming hair, but towards evening the sky became overcast, it thundered and lightened, while the dark sea lifted the large icebergs high up so that they shone in the strong glare of the lightning. All the ships took in their sails, distress and horror reigned, but she sat calmly on her iceberg and watched the lightning as it zigzagged into the troubled sea.

The first time any of the sisters rose to the surface of the water she was always enraptured with the new and beautiful things she saw, but afterwards, when, as grown-up girls they had leave to go above whenever they chose, they became quite indifferent to such trips. They longed for the deep water, and in about a month

would say that it was nicest down below, for there one felt so thoroughly at home.

Very often in the evenings the five sisters would entwine their arms and rise in a row to the surface of the water. They had beautiful voices, sweeter than any human voice, and when a gale was blowing and they had reason to believe a ship might be lost, they would swim before the vessel and sing sweetly of the joys to be found at the bottom of the sea, and bid the sailors not be afraid to come down. But the sailors could not understand their words, they fancied the sound was the howling of the storm, nor did they ever see any of the beautiful things below, for when the ship sank the crew were drowned and only their dead bodies reached the Sea-King's palace.

Now when her sisters thus rose arm in arm through the sea, the little sister would remain below alone looking up after them, and she felt as if she must cry; but mermaids have no tears and so suffer all the more.

"Oh, if only I were fifteen!" said she "I know that I shall love the world above and the men who live there."

And at last she *was* fifteen years old.

"Well, now at last we have *you* off our hands," said her grandmother, the widow of the late king.





In a little creek she came upon a whole swarm of human children, they were running and splashing about in the water. She wanted to play with them, but they ran away in terror.

"Come here and let me dress you like your sisters." And she placed a wreath of white lilies in her hair, but every petal was the half of a pearl, and the old lady commanded eight large oysters to cling fast to the Princess's tail to mark her high rank.

"But they hurt me so!" said the little mermaid.

"Yes, but one must suffer a little for the sake of appearances," said the old lady.

Oh, how gladly the little mermaid would have torn off all this finery and laid aside her wreath, the red flowers from her garden suited her much better; but she dared not do it "Farewell!" she said and rose, light and bright as a bubble, up to the surface of the water.

The sun had just sunk as she raised her head above the sea, but the clouds were still pink and gold, and in the midst of the pale sky sparkled the evening star, so clear and lovely. The air was mild and cool and the sea as still as a mirror

A large black ship with three masts lay upon it; only a single sail was up, for not a breath of wind stirred and the sailors were sprawling about on the masts and rigging. Music and singing were going on, and as the evening darkened hundreds of gay-coloured lamps were lit, looking as if the flags of all nations were waving in the air. The

little mermaid swam close up to the cabin window, and every time the water raised her she would peep in through the panes and could see many finely-dressed people. The handsomest was certainly the young Prince with large black eyes. He could not be more than sixteen years old, and this was *his* birthday and that was why they were having all this merriment. The sailors danced upon the deck, and when the young Prince stepped up, more than a hundred rockets rose into the air; they shone as bright as day, so that the little mermaid was frightened and dived down beneath the water. But she soon popped up her head again and then it seemed as if all the stars of heaven were falling down upon her. Never had she seen such fireworks; large suns spun round and round, throwing out sparks, splendid fiery fishes dashed about in the blue air, and everything was reflected in the clear, calm sea. On the ship itself it was so light that you could clearly see every rope and spar and every person. And oh! how handsome the young Prince looked, as he pressed people's hands and laughed and smiled while the music resounded through the lovely night.

It grew late, but the little mermaid could not take her eyes from the ship and the handsome

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Prince The many-coloured lanterns were put out, no more rockets rose into the air, and no more salvos were fired, but from deep down in the sea there came a murmuring and a roaring Still she sat upon the water, rocking up and down with it so that she could look into the cabin But now the ship took a swifter course, one sail after another was spread; the billows rolled higher and there came lightning from far away.

A frightful storm was coming on, that was why the sailors reefed the sails The huge ship pitched to and fro as it flew across the raging ocean, the water rose like great black mountains, seeming as if they would roll right over the masts, but the ship dived like a swan between the billows and then rose again on the towering waves The little mermaid thought this grand sport, but not so the sailors The ship strained and cracked, the thick planks bent under the repeated shocks of the sea, the mast snapped in the middle like a reed, and the ship heeled over on her side while the water rushed into the hold And now the little mermaid saw that they were in danger, and she herself had to beware of the spars and wreckage of the ship as they drove along upon the water For a moment it was so pitch dark that she could see nothing at all, but

when a flash of lightning came it was bright enough for her to see everything on the ship. Everybody there was tumbling about anyhow. She looked especially for the young Prince and as the ship went to pieces, saw him sink into the deep sea. She was quite pleased, for now he would come down to her, but then it occurred to her that human beings cannot live under the water and that he would be dead by the time he reached her father's palace. Die he must not, oh no! So she swam among the spars and planks which drifted on the sea, quite forgetting that they might crush her. Then she ducked beneath the water, and rising again on the billows managed at last to reach the young Prince, who by now was scarcely able to swim any longer in the raging sea. His arms and legs began to fail him, his beautiful eyes were closed, he must surely have died if the little mermaid had not come to his assistance. She held his head above the water and then let the billows drive them together wherever they pleased

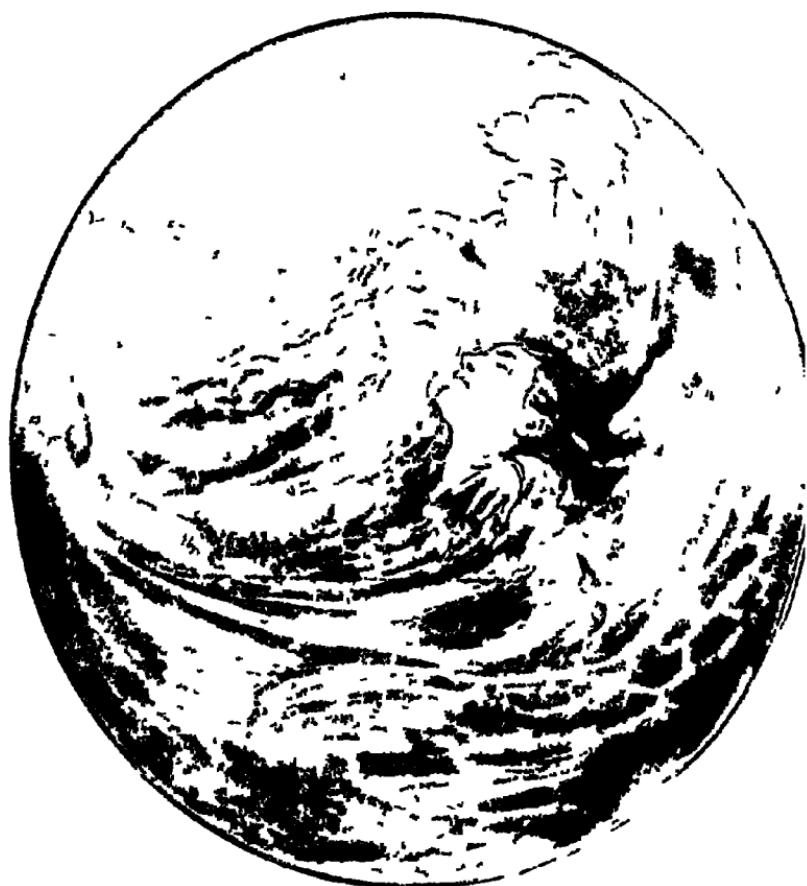
When morning dawned the storm passed, but not a fragment of the ship was to be seen. The sun rose red and beaming from the water; the Prince's cheeks regained the hue of life, but his eyes remained closed. The mermaid kissed his

lofty handsome brow and stroked back his wet locks He looked just like the marble statue down in her little garden , she kissed him again and longed that he might live

And now she saw in front of her the mainland, with lofty blue mountains, on the summits of which the snow shone as though great flocks of white swans lay there Near the shore were lovely green forests and in front stood a church or convent, she did not exactly know what—but it was a large building of some sort Lemon and orange trees grew in the garden, and in front of the gate stood tall palm-trees The sea formed a little creek here, it was quite calm but very deep, right up to the cliff where the sea had washed up the fine white sand , thither she swam with the handsome Prince and laid him on the sand, taking great care that his head should lie higher than his body in the warm sunshine

And now the bells in the large white building started ringing, and a number of girls came walking through the garden The little mermaid swam farther out behind some lofty rocks which rose out of the water, covering her hair and breast with sea-foam that no one could see her face There she watched to see who would come to the poor Prince.

She ducked beneath the water, and rising again on the billows managed at last to reach the young Prince, who by now was scarcely able to swim any longer in the raging sea. His beautiful eyes were closed and he must surely have died if the little mermaid had not come to his assistance.





It was not long before a young girl came that way, she was quite frightened when she saw him, but only for a moment Then she brought a number of people, and the mermaid saw that the Prince came to life again, and smiled on those around him But he did not send a smile to her, for of course he did not know that she had saved him She felt so grieved that when he was carried away into the large building she dived down under the water full of sorrow and sought her father's palace

She had always been silent and thoughtful, but after this she became still more so Her sisters asked her what she had seen when she went above for the first time, but she would tell them nothing.

Many a morning and many an evening she rose to the spot where she had last seen the Prince She saw how the fruits of the garden ripened and were plucked, she saw how the snow melted on the lofty mountains, but the Prince she did not see, and every time she returned home more and more sorrowful Her only consolation was to sit in her little garden and fling her arms round the pretty marble statue which was so like the Prince But she did not attend to her flowers at all, they grew as if in a wilderness right over the paths and wreathed their long

stalks and leaves among the branches of the trees till it was quite gloomy beneath their shade.

At last she could endure her sorrow no longer, but told her story to one of her sisters, and so all the others got to know it ; and then it reached the ears of a couple of other mermaids, who told it to nobody but their closest friends. One of these happened to know who the Prince was and all about him ; she also had seen the merry-making on board the ship and knew whence he came and where his kingdom lay.

“ Come, little sister ! ” said the other Princesses, and with their arms round each other’s shoulders, they rose in a long row out of the sea in the place where they knew the Prince’s palace stood. This was built of a light yellow glistening stone, with broad marble staircases, one of which reached straight down to the sea. Gorgeous gilded cupolas rose above the roof, and between the columns which went round the whole building stood marble statues which looked like living beings. Through the lofty windows you looked into magnificent rooms hung with costly silk curtains and tapestries, and all the walls were adorned with large pictures, so that it was a pleasure to look at them. In the midst of the principal room splashed a large fountain, the jets of which rose

high into the air towards the glass cupola, through which the sun shone down upon the water and the beautiful plants which grew in the basin

So now she knew where the Prince dwelt, and many an evening and many a night she rose upon the water. She swam much nearer to the land than any of the others had ventured to do, nay, she went up the narrow canal, under the marble balcony which cast a long shadow across the water. Here she used to sit and gaze at the young Prince, who fancied he was quite alone in the bright moonshine.

Many an evening she saw him sail in his splendid boat with banners waving and music playing; she would peep from among the green rushes, and when the wind played with her long silvery white veil and people caught sight of it, they took it to be a swan spreading its wings.

Many a night, too, when the fishermen were trailing their nets by torch-light, she heard them speaking of the young Prince, and praising him so highly that she was more than ever glad that she had saved his life when he was drifting on the billows. And she remembered how his head had rested on her breast, and how ardently she had kissed him; but as he knew nothing of all this, he could not even dream about her.

So she got to love mankind more and more, and to long more and more to be among them. Their world seemed so much grander than her own ; why, they could fly across the sea in ships, ascend the lofty mountains high above the clouds, and the lands they called their own extended with their woods and meadows farther than her eye could reach.

There was much she would have liked to know, but her sisters were not able to answer her questions. She therefore asked her old grandmother, who knew all about the upper world, which she very correctly called the lands above the sea.

" If men do not get drowned," asked the little mermaid, " can they live for ever ? Don't they die as we do down here in the sea ? "

" Yes," said the old dame, " they also must die ; and indeed their life is shorter than ours. We can live and be three hundred years old, but when at last we cease to be, we become mere foam upon the water, and are not even buried among our dear ones. We have not immortal souls ; we never enter upon a new life ; we are like the green rushes, if once they be cut down, they cannot grow again. Men, on the other hand, have souls which always live—even after the body has been buried in the earth ; they rise up through the

clear air, to the shining stars. Just as we rise out of the sea up to the lands of men, so their souls mount to beautiful unknown regions of which we shall never catch a glimpse ”

“ Why have we not an immortal soul ? ” asked the little mermaid sorrowfully “ I would give all the hundreds of years I may have to live to be a human being but for a single day that so I might hope to live in the world above the sky ! ”

“ You must not bother your head about that, ” said the old grandmother , “ We have a much better and happier lot than mankind above ”

“ So I shall die and scud away like foam upon the sea, hear no more the music of the billows, and see no more the pretty flowers and the red sun. Can I then do nothing at all to win an immortal soul ? ”

“ No ! ” said the old grandmother, “ only if a man grew to love you so dearly that you were more to him than father or mother, if he clove to you with all his heart and soul, and let the priest lay his right hand in yours and vowed to be faithful to you here and in all eternity, then his soul would flow over to your body and you would have a share in the bliss that comes to human beings He would have given you a soul, and yet have kept his own But that can never be !

The very thing that is so pretty in the sea, here, your fish's tail, is looked upon as hideous on earth because they know no better. Up there one must have a couple of awkward things called legs to be thought handsome ! ”

Then the little mermaid sighed and looked sorrowfully at her fish's tail

“ Let us be content with our lot,” said the old grandmother, “ and hop and skip about to our hearts' content in the three hundred years we have to live in Upon my word we have a nice long time of it. We'll have a Court ball this very evening ! ”

It was indeed a gorgeous sight, such as one never sees on earth The walls and ceiling of the vast dancing-hall were of glass, thick but clear Many hundreds of huge shells, rosy red and grassy-green, were hung in rows on each side, full of blue blazing flames which lit up the whole room and shone right through the walls, so that the sea around was bright for quite a long distance Countless fishes, both small and great, came swimming past the glass walls , the scales of some of them shining purple red, while others sparkled like gold and silver.

Through the great ball-room flowed a broad stream, and on this the mermen and the mermaids

danced to their own pretty songs. Such lovely voices are unknown on earth. The little mermaid sang the sweetest of them all and they clapped her loudly, for a moment her heart was glad, for she knew that she had the loveliest voice of all creatures on the earth or in the sea. But soon her thoughts turned once more to the world above her, she could not forget either the handsome Prince or her sorrow at not possessing, like him, an immortal soul. So she presently stole from her father's palace, with its mirth and melody, and sat sorrowfully in her little garden.

Here she heard a bugle sounding down through the water and she thought, "Now I know *he* is sailing up above there—he whom I love more than my father or mother, to whom the thoughts of my heart cleave and in whose hands I would willingly lay my life's happiness. Everything will I venture to win him and an immortal soul! While my sisters are dancing within my father's palace, I will go to the sea-witch, I have always hitherto been afraid of her, but, perchance, she may help and advise me."

So the little mermaid went right out of her own part of the sea towards a raging whirlpool behind which the sea-witch dwelt. She had never gone that way before. No flowers nor sea-grasses grew

there ; only the bare grey sandy bottom stretched out towards the whirlpool where the water, like a rushing mill-stream, eddied round and round, dragging everything it caught hold of into the deep. She had to go right through these buffeting whirlpools to reach the sea-witch's domain, and here, for a long stretch, there was no other way than across hot bubbling mire which the witch called her turf-common. Behind this stood her house in the midst of a most strange wood. All the trees and bushes were polypi—half animal, half vegetable—they looked like hundred-headed serpents growing out of the ground ; all their branches were long slimy arms, with fingers like supple snakes, and they were twisting and twirling from the roots through every joint to the outermost tips of their branches. Everything in the sea which they could catch hold of they wound themselves about and never let go again. The little mermaid was quite terrified and remained standing there, her heart thumping for fear. She was very near turning back, but then she thought of the Prince and of the human soul, and her courage came back. She bound her long flowing hair close to her head, so that the polypi might not seize it, then she crossed both hands over her breast, and darted through the





Many an evening and many a night she rose upon the water and would gaze at the young Prince, who fancied he was quite alone in bright moonshine.

water as only fishes can, right between the hideous polypi, which stretched out their long supple arms and fingers after her. She saw that nearly every one of them still held something which it had gripped with hundreds of little fingers as strong as iron bands. Men who had perished in the sea and sunk far down peeped forth from the arms of the polypi in the shape of white skeletons. Ships' rudders and coffers too they held fast ; there were also the skeletons of land animals and even a little mermaid whom they had caught and crushed to death, and that was to her the most terrible sight of all.

And now she came to a large slimy open swamp in the wood, where large fat water-snakes were wallowing and showing their ugly whitish-yellow bellies. In the midst of this space a house had been built from the bones of shipwrecked men ; and here sat the sea-witch, letting a toad eat from her mouth just as men allow canary-birds to pick sugar. She called the hideous fat water-snakes her chicks and let them creep all over her large spongy bosom

“ I know what you want ! ” said the sea-witch ; “ you’re a fool for your pains ! Nevertheless you shall have your own way, for you will get into trouble, my pretty Princess. You want to be

rid of your fish's tail, eh ? and to have a couple of stumps to walk about on as men have, so that the young Prince may fall in love with you, and you may get him and an immortal soul into the bargain ! ”

With that, the witch laughed so loudly and horribly that the toad and the snakes fell to the ground, where they lay wriggling about.

“ You have come in the very nick of time,” said the witch ; “ if you had put it off till to-morrow, at sunrise, I should not have been able to help you for another year I will brew you a potion, and you must swim to land, sit on the shore, and drink it off before sunrise. Then your tail will split and shrivel up into what men call nice legs ; but it will hurt, mind you, for it will be like a sharp sword piercing you. All who see you will say that you are the loveliest mortal they ever saw You will keep your elegant floating gait, no dancing girl will be able to move so lightly as you , but every stride you take will be to you like treading on sharp knives till the blood flows If you still choose to suffer all this, I have the power to help you ”

“ I do,” said the little mermaid with a trembling voice ; she thought of the Prince and of winning an immortal soul

"But remember," said the witch, "once you have a human form you can never become a mermaid again! You will never be able to dive down through the water to your sisters or return to your father's palace, and if you should fail to win the Prince's love so that, for your sake, he forgets father and mother and cleaves to you with all his soul, and lets the priest join your hands and make you man and wife, you will not obtain an immortal soul! The very first morning after he has married another your heart will break and you will become mere foam upon the billows!"

"Be it so!" said the little mermaid, but she was as pale as death.

"But you must pay me too," said the witch, "and it will not be a small thing either that I demand. You have the loveliest voice of all things here at the bottom of the sea, and you fancy you will enchant him with that, I know; not at all, for you must give that voice to me. I choose to have your best possession in return for my precious potion, for have I not to give you of my own blood in it, so that the potion may be as sharp as a two-edged sword?"

"But if you take my voice," asked the little mermaid, "what have I left?"





She bound her long, flowing hair close to her head, so that the polypi might not seize it ; then she crossed both hands over her breast and darted through the water as only fishes can, right between the hideous polypi, which stretched out their long supple arms and fingers after her

"Your lovely form," said the witch, "your light gait and your speaking eyes, you can fool a man's heart with them, I suppose? Well! have you lost courage, eh? Put out your little tongue and I will cut it off in payment, and you shall have the precious potion!"

"Be it so, then!" said the little mermaid, and the witch put her kettle on the fire to brew the magic potion. "Cleanliness is a virtue," said she, and she scoured out the cauldron with the snakes, which she tied into a knot for the purpose; then she gashed herself in the breast and let her black blood drip down into the cauldron. The steam that rose from it took the strangest shapes, so that one could not look at them without anguish and terror. Every moment the witch put something fresh into the cauldron, and when it was well on the boil it made a noise like a weeping crocodile. At last, when the drink was ready, it looked like the clearest water!

"Here you are!" said the witch, and cut out the tongue of the little mermaid; so that she was now quite dumb, and could neither sing nor talk.

"If the polypi grip you as you go back through the wood," said the witch, "just throw a single drop of this potion over them, and their arms and fingers will burst into a thousand bits!" But

the little mermaid had no need to do this, the polypi shrank from her in terror when they saw the potion, which shone in her hand like a dazzling star. So very soon she got through the wood, the swamp and the raging whirlpool

She could see her father's palace, the lights in the long dancing-hall had been put out; all within were doubtless asleep, but she dared not visit them now that she was dumb and was about to go away from them for ever. Her heart felt as if it must burst asunder for sorrow. She stole into the garden, plucked a flower from each of her sister's flower-beds, threw a thousand kisses towards the palace, and ascended again through the dark blue waters

The sun had not yet risen when she saw the Prince's palace, and mounted the splendid marble staircase. The moon was shining bright and beautiful. The little mermaid drank the sharp burning potion, and it was as though a two-edged sword pierced right through her body; she moaned with agony and lay there as one dead.

When the sun rose over the sea she woke and felt a sharp pang; but right in front of her stood the handsome young Prince. He fixed his coal-black eyes upon her so intently that she cast her own eyes down and saw that her fish tail had

Right in front of her stood the handsome young Prince. He fixed his coal-black eyes upon her so intently that she cast her own eyes down and saw that her fish tail had disappeared.





disappeared, and that she had the prettiest little white legs, but she was quite naked, so she wrapped herself in her long, thick hair. The Prince asked who she was and how she had come thither; but she could only look at him with her dark blue eyes mildly and sadly, for speak she could not. Then he took her by the hand and led her into the palace. Every step she took was, as the witch said it would be, as if she were treading on points of needles or sharp knives, but she willingly bore the pain, and holding the Prince's hand mounted the staircase as light as a bubble, so that he and every one else were amazed at her light and graceful movements.

She was now arrayed in the most costly garments, all silk and muslin. None in the whole palace was so lovely, but she was dumb, and could neither sing nor speak. Lovely slave-girls, clad in silk and gold, came and sang to the Prince and his royal parents, one of them sang more sweetly than the rest, and the Prince clapped his hands and smiled at her. This troubled the little mermaid. She knew that she herself had sung far more sweetly, and she thought: "Oh, that he might know that for the sake of being near him I have given away my voice for ever!"

Then the slave-girls danced some light and

graceful measures to the loveliest music. At this the little mermaid lifted her lovely white arms, raised herself on the tips of her toes, and floated lightly across the floor as none had ever done before. Every movement made her loveliness more apparent and her eyes spoke more deeply to the heart than did ever the songs of the slave-girls.

Everybody was enchanted with her, especially the Prince, who called her his little foundling, and she danced more and more, though every time her feet touched the floor it was as if she trod on a sharp knife. The Prince declared that she should always be with him, and she was given leave to sit outside his door on a velvet cushion.

Presently he had her dressed in a male costume that she might ride out with him. They rode together through the fragrant woods, where green branches touched their shoulders and little birds sang among the fresh green leaves. She clambered with the Prince right up the high mountains, and although her tender feet bled so that others saw it, she only laughed at the suffering and followed him till they saw the clouds sailing below them like flocks of birds departing to a foreign land.

At night, in the Prince's palace, while others

slept, she would go out on the broad marble steps, for it cooled her burning feet to stand in the cold sea-water, and then she thought of the friends she had left in the depths below

One night her sisters rose up arm in arm ; they sang so sorrowfully as they swam in the water. She nodded to them, and they recognized her, and told her how miserable she had made them all by going away

After that, they visited her every night, and once she saw, a long way off, her aged grandmother, who had not come up above the sea for many years, and the Sea-King with his crown upon his head They stretched out their hands towards her, but dared not come so close to land as did her sisters

Every day she became dearer to the Prince, he loved her as one might love a dear, good child, but to make her his queen never entered his mind Yet his wife she must become, or she would never obtain an immortal soul, but would melt to foam on the morning of his wedding another.

“ Do you love me most of all ? ” the eyes of the little mermaid seemed to ask when he took her in his arms and kissed her fair brow.

“ Yes, you are dearest of all to me,” said the Prince, “ for you have the best heart You are

the most devoted to me, and you are just like a lovely maiden I once saw but shall never see again I was on a ship which was wrecked, the billows cast me ashore near a holy temple, where many young girls were worshipping The youngest, who found me on the sea-shore and saved my life, I only saw twice ; she is the only one I could love in this world, but you are like her, you almost drive her image from my soul , she belongs to the holy temple, and therefore my good fortune has sent you to me instead, and we will never part ”

“ Alas ! he knows not that it was I who saved his life,” thought the little mermaid “ I bore him right over the sea to the wood where the holy temple stands, I sat beneath the foam and looked to see if any one would come ; I saw the pretty girl whom he loves better than he does me ! ” And the mermaid drew a deep sigh, for weep she could not. “ He says the girl belongs to that holy temple, that she will never come forth into the world, and that they will never meet again. I am with him, I see him every day, I will cherish and love him, and sacrifice my life to him ! ”

But now came talk that the Prince was to marry and would take the lovely daughter of the neighbouring king, and that was why he now set

about fitting out a splendid ship. "The Prince is travelling to see the land of the neighbouring king," was said, but everyone knew it was really to see the neighbouring king's daughter that he went forth with such a grand retinue.

The little mermaid shook her head and smiled, she knew the Prince's thoughts better than did all the others "I must travel," he had said to her, "I must see this beautiful Princess, my parents require it of me, but they shall not force me to bring her home as my bride I cannot love her, she is not like the lovely girl in the temple whom you are like Should I ever choose me a bride, it would rather be you, my dumb foundling with the speaking eyes!" And he kissed her rosy mouth, played with her long hair, and laid his head close to her heart while she dreamt of human bliss and an immortal soul

"Surely you are not frightened at the sea, my dumb child!" said he, as they stood on the fine ship which was to carry him to the land of the neighbouring king. And he talked to her of storm and calm, of the strange fishes of the deep, and what the divers see down there, and she smiled, for she knew better than any one else about the bottom of the sea

In the moonlight nights, when all on board

were asleep save the man at the helm, she sat at the side of the ship and looked down through the clear water and seemed to see her father's palace. High above it stood the old grandmother with her silver crown on her head, staring up at the ship's keel through the contrary currents. Then her sisters came up to the surface of the water, and gazed sadly at her and wrung their white hands. She beckoned to them, smiled, and would have told them that she was well and happy, but the cabin-boy drew near at that moment and her sisters dived beneath the waves, so that she half fancied the white things she had seen were but the foam upon the waters.

The next morning the ship sailed into the port of the neighbouring king's splendid capital. The church bells were ringing, trumpets sounded from the tops of the high towers, and soldiers stood drawn up with waving banners and flashing spears.

Every day now brought a fresh feast or entertainment. Balls and assemblies followed in rapid succession, but the Princess was not yet there, for she had been brought up in a holy temple far away, they said, where she had learnt all the royal virtues. At last she arrived.

Full of eagerness, the little mermaid stood there to see her loveliness; and she had to recognize that

a more beautiful face she had never seen. Her skin was transparently fine, and from behind the long dark lashes smiled a pair of dark blue, faithful eyes

"It is you!" cried the Prince, "you who saved me when I lay like a corpse on the sea-shore!" And he embraced his blushing bride. "Oh! I am so happy, I don't know what to do!" said he to the little mermaid. "The very best I dared to hope has come to pass. You too will rejoice at my good fortune, for you love me more than them all!" And the little mermaid kissed his hand, but she felt already that her heart would break. Yes, his bridal morn would mean death to her, and she would be changed into sea-foam

All the bells were ringing, and heralds rode through the streets to proclaim the espousals.

Perfumed oil burned in precious silver lamps upon every altar. The priests swung their censers, and the bride and bridegroom gave each other their hands and received the bishop's benediction. The little mermaid, dressed in cloth of gold, stood there and held up the bride's train, but her ears did not hear the festal music, nor did her eyes see the sacred ceremony; she thought of her night of death, of all that she had lost in this world.

The same evening the bride and bridegroom

went aboard the ship. Cannons roared and flags waved, and on the deck was placed a royal bridal tent of cloth of gold and purple and precious furs

The sails swelled out in the breeze, and the ship glided lightly over the ocean. When it grew dark, coloured lamps were lit, and the sailors danced merrily on the deck. The little mermaid could not help thinking of the first time she had risen above the sea, and seen the same gaiety and splendour. She whirled round and round in the dance, skimming along as the swallow skims when it is pursued, and everyone applauded her, for never before had she danced so beautifully. There was a piercing as of sharp knives in her feet, but she heeded it not ; the anguish of her heart was far more piercing. She knew this was the last evening she would ever be able to see him for whom she had forsaken relatives and home, sacrificed her lovely voice, and suffered endless tortures day by day, without his having even dreamt of it. It was the last night on which she was to breathe the same air as he, to look upon the deep sea and the star-lit sky. An eternal night, without a thought, or a dream, awaited her ; for she had no soul and could not obtain one.

All was joy and gaiety on board the ship till long past midnight, and all the time she laughed





She plunged from the ship into the sea.

and danced with the thought of death in her heart. The Prince kissed his lovely bride and she toyed with his black hair, and arm in arm they went to rest in their splendid tent.

It grew dark and all was still on board, only the steersman stood there at the helm. The little mermaid leaned her white arms on the railing and looked towards the east for the rosy dawn; the first sunbeam, she knew well, must kill her. Then she saw her sisters rise up from the sea, and they were as pale as she. Their long fair hair streamed no longer in the breeze; it had all been cut off.

"We have given it to the witch to secure help that you may not die to-night! She has given us this knife; look how sharp it is! Before the sun rises you must plunge it into the Prince's heart, and then, when his warm blood sprinkles your feet, they will again close up into a fish's tail, and you will be once more a mermaid, and may sink through the water to us, and live your three hundred years before you become dead, salt sea-foam. Hasten then! Either he or you must die before sunrise. Our old grandmother has sorrowed so that her hair has fallen off, as ours has fallen off beneath the witch's shears. Kill the Prince and come back to us! Hasten!

Do you not see the red streaks yonder in the sky? A few more minutes and the sun will rise and you must die." And they heaved a deep sigh and sank beneath the waves.

The little mermaid drew aside the purple curtains from the tent, and saw the beautiful bride asleep with her head on the Prince's breast. She bent down and kissed his fair brow; then looked up at the sky where the red dawn grew brighter and brighter. Then she gazed at the sharp knife, and again turned her eyes on the Prince, who, in his dreams, called his bride by name, she alone was in his thoughts. The knife quivered in the mermaid's hand. Should she strike? Another moment and she cast it far away in the waves. They shone red where it fell, as if drops of blood gurgled up from the water. Once again she gazed with aching eyes at the Prince, then plunged from the ship into the sea, and felt her body dissolving into foam.

And now the sun rose out of the sea, its rays fell with gentle warmth upon the cold sea-foam, and the little mermaid did not feel the pangs of death. She saw the bright sun, and above her hundreds of beautiful transparent shapes were hovering. She could still catch a glimpse of the

white sails of the ship and of the red clouds in the sky. The voice of the shapes was all melody, but so ethereal that no human ear could hear it, just as no human eye could see them ; they had no wings, but their very lightness poised them in the air. The little mermaid saw that she now had a body like theirs, and it rose higher and higher from out the foam.

“ To whom have I come ? ” cried she, and her voice sounded like the voices of the other beings, so ethereal that no earthly music could equal it.

“ To the daughters of the air,” answered they , “ a mermaid has not an immortal soul, and can never have one unless she wins a man’s love , her eternal existence depends upon a Power beyond her. The daughters of the air, likewise, have not an immortal soul, but they can obtain one by their good deeds We fly to the hot countries, where the sultry, pestilential air destroys the children of men ; there we waft coolness and spread the fragrance of flowers through the air to heal and refresh. When for three hundred years we have striven to do all the good in our power we obtain an immortal soul and share the eternal destinies of the human race You, poor little mermaid, have striven after good with your whole heart , like us, you have suffered and

endured, and raised yourself into a spirit of the air. Now, therefore, you can win for yourself an immortal soul after three hundred years of good deeds."

And the little mermaid raised her bright arms towards the sun, and for the first time felt tears in her eyes

There were life and bustle on board the ship again; she saw the Prince and his beautiful bride seeking her, and then gazing sadly down upon the bubbling foam, as if they knew she had plunged into the billows. Unseen by either of them, she kissed the bride's forehead, smiled upon the Prince, and rose with the other children of the air up to the rosy clouds which were sailing the sky

"For three hundred years we shall float and float till we glide right into God's kingdom"

"Yea, and we may get there still sooner," whispered one "Unseen we enter the houses of men where there are children, and every day we find a good child who gladdens his parents' hearts, and deserves their love, God shortens our time of trial. The child does not know when we fly through the room, but when we can smile with joy over it a whole year is taken from the three hundred. But whenever we see a bad and ill-behaved child we shed tears of sorrow, and every tear adds a day to our time of trial!"

## THE TINDER BOX

A SOLDIER came marching along the high road. Left, right ! left, right ! He had his knapsack on his back and a sword by his side, for he had been to the wars and was now returning home.

Then he met an old witch on the highway ; she was ugly and her underlip hung down to her chin

“ Good evening, soldier,” said she ; “ what a fine sword you have, and a big knapsack, too ; you are a proper sort of soldier ! You shall have as much money as you like ”

“ Thank you, old witch ! ” said the soldier

“ You see that large tree ? ” said the witch, pointing to a tree which stood close beside them  
“ It is quite hollow inside. You must climb to the top, and then you will see a hole through which you can let yourself right down into the tree. I will fasten a rope round your body so that I may draw you up again when you call out ”

“ But what am I to do down in the tree ? ” asked the soldier.

“ Get money ! ” said the witch. “ When you

get to the bottom of the tree you will see a large passage, it is quite light, for hundreds and hundreds of lamps burn there. Presently you will come to three doors ; you can open them all, for the keys are in them. When you enter the first chamber, you will see in the middle of the floor a large chest, on top of which sits a dog with eyes as large as teacups. But you need not mind him. I will give you my blue-striped apron to spread on the floor ; then march briskly up to the dog, seize him, place him on my apron, open the chest and take as many pieces of money as you please. They are of copper, the whole lot of them, but if you would rather have silver, you need only go into the next chamber. There sits a dog with eyes as large as mill-wheels. But never mind him. Put him on my apron and help yourself to the money. If, however, you would prefer gold, you can have that also—as much of it as you can carry, by going into the third chamber. But the dog that sits on the money-chest in that room has eyes each of which is as big as a tower. He is something like a dog, I can tell you ! But never mind him. Just put him on my apron and he won't hurt you a bit, and then you can take out of the chest as much gold as you like."

The dog with eyes as big as teacups was off at once, and before the soldier had time to think about it he reappeared with the Princess. She lay asleep on the dog's back, and was so lovely that anyone could see at once that she was a real Princess.





"It doesn't sound so bad," said the soldier. "But what am I to give you, old witch?—for you mean to have something out of this for yourself, I know."

"No," said the witch, "I won't have a single penny. The only thing I ask you to do is to bring me an old tinder box which my grandmother forgot when she went down there."

"All right! Let me fasten the rope round my body," said the soldier.

"Here it is," said the witch, "and here is my blue-striped apron."

So the soldier climbed the tree, let himself plump down into the hole, and found himself, as the witch had said he would, in a large passage where hundreds and hundreds of lamps were burning.

And now he unlocked the first door. Ugh! there sat the dog with eyes as large as teacups and glared at him.

"You're a pretty fellow!" said the soldier putting him on the witch's apron, and taking as many copper coins as he could cram into his pockets. Then he locked the chest, put the dog on top of it again, and went into the second chamber. Ugh! there sat the dog with eyes as big as mill-wheels.

" You shouldn't stare at me so much," said the soldier, " you might injure your eyesight ! " And with that he placed the dog on the witch's apron, but when he saw the heaps of silver money in the chest he flung away all the copper money he had and filled his pockets and his knapsack with nothing but silver.

Then he went into the third chamber. Now this was truly hideous. The dog in that room really had two eyes each one of which was as large as a tower, and they ran round in his head like clock-work.

" Good evening ! " said the soldier, and touched his cap, for a dog like that he had never seen before. But after looking at him a little longer, " Come, come," thought he, " I've stared enough now, surely ! " and lifting him down on to the floor he opened the chest.

Gracious ! what a lot of gold was there ! Why, with that money he might have bought the whole of the town, and all the sugar pigs of all the stall-women there, together with all the tin soldiers, whips, and rocking-horses in the whole world ! Yes, there was money, and no mistake !

So the soldier threw away all the silver pieces he had filled his pockets and his knapsack with, and took gold instead—and he filled not only

his pockets and his knapsack, but his cap and his shoes so that he could hardly walk. Then he lifted the dog on to the chest again, banged the lid, and bawled up the tree, "Draw me up now, old witch!"

"Have you got the tinder box?" asked the witch

"Oh!" cried the soldier. "I had clean forgotten it," and he went back and fetched it. The witch then drew him up, and he stood again on the highway, with his pockets, boots, knapsack, and cap crammed with gold.

"What are you going to do with this tinder box?" asked the soldier.

"That doesn't concern you," said the witch. "You've got your money, haven't you? Now give me the tinder box, that's all I want."

"Rubbish!" said the soldier. "Will you tell me this instant what you want with it, or I'll draw my sword and cut your head off!"

"No," said the witch, "I won't!"

The soldier at once struck her head off, and there she lay. He then tied up all his money in her apron, slung it over his shoulder, put the tinder box in his pocket, and walked straight to the town.

It was a pretty town, and he put up at the nicest

inn, demanding the very best rooms they had and the food he liked most, for now he was rich—he had lots and lots of money.

To the servant who cleaned his shoes it seemed absurd that so rich a gentleman should have such shabby old shoes, but he had not yet had time to buy new ones.

Next day he got proper walking boots and some really beautiful clothes. So the common soldier had now become a fine gentleman, and the people told him all about their town and its riches and splendour, and about their King, and what a charming daughter he had.

"Where can one get a peep at her?" asked the soldier.

"You can't see her at all," they said; "she lives in a large copper castle with walls and towers all around it. None but the King may go in and out of it to see her, for it has been foretold that she will marry a mere common soldier, and the King cannot endure the thought of that."

"Would that I might but see her!" thought the soldier, but of course this was quite out of the question.

And now he lived right merrily, went to the theatre, drove in the King's park, and gave lots of money to the poor, which was very handsome.

of him. He knew indeed, of old, how bad it was to be without a farthing. But now he was rich and had fine clothes, and plenty of friends who all said what a fine fellow he was, and what a perfect gentleman, and the soldier was very pleased to hear this said.

But as he was paying and giving money away every day, and none was coming in, he at last found that he had only two farthings left, and was obliged to leave the grand rooms where he had been living, and make the best of a little garret under the roof, where he had to clean his own boots, and even to mend them with a darning needle. And now not one of his friends came to see him—they did not like going up so many stairs.

One very dark evening, he had not money enough even to buy himself a light, when it occurred to him that there might be the fag end of a candle in the tinder box he had picked up in the hollow tree when the witch had helped him down. So he took out the tinder box and the candle stump, but no sooner had he struck a spark from the flint than the door flew open and the dog with eyes as big as teacups, whom he had seen down in the tree, stood before him and said, "What does my lord command?"

"Well, I never!" said the soldier. "It will be a useful sort of tinder box if I can get whatever I want! Bring me some money," said he to the dog, and whisk! it was gone—whisk! and it was back again, holding in its mouth a large bag full of copper coins.

And now the soldier understood what a very fine sort of tinder box it really was. If he struck the flint once, there came the dog who sat on the chest full of copper coins; if he struck twice, in came the dog who watched the silver money, and if he struck thrice, there appeared the dog who minded the gold.

So the soldier went downstairs again to his handsome rooms, bought some more fine clothes, and all his old friends immediately recognized and made much of him.

One night he fell thinking. "How ridiculous it is that one cannot get a peep at the Princess! Every one says how lovely she is, but what is the good of that if she is to mope away all her days in the big copper castle with the many towers? Can't I get to see her somehow? Where's my tinder box?" So he struck a spark, and whisk! there stood the dog with the eyes as big as tea-cups.

"I know that it is midnight," said the soldier,

" but I should very much like to see the Princess, if it were only for a moment ! "

The dog was off at once, and before the soldier had time to think about it, he reappeared with the Princess. She lay asleep on the dog's back, and was so lovely that any one could see at once she was a real Princess. The soldier could not let well alone. Kiss her he must, for he was a true soldier.

The dog then ran back with the Princess. But next morning, when the King and Queen were having breakfast with her, the Princess said that she had dreamed such a strange dream in the night about a dog and a soldier. She had ridden on the dog, and the soldier had kissed her.

" A very pretty story truly ! " said the Queen.

And now one of the old ladies-in-waiting was set to watch by the Princess's bed next night to see if it were really a dream or what else it could be.

The soldier longed very much for another glimpse of the Princess, so the dog came again at night, took her, and ran away with all its might. But the old lady-in-waiting put on waterproof boots and ran just as quickly behind them. When she saw them disappear into a large house, she thought, " Now I know where

it is," and marked a great cross on the door with a piece of chalk. Then she went home and lay down, and the dog also came back that way with the Princess ; but when he saw that a cross had been marked on the door where the soldier dwelt, he took a piece of chalk and marked crosses on *all* the doors in the town, so that the Court dame could not possibly find the right one

Early in the morning the King and the Queen, the old Court dame and all the Court officials, came to see where the Princess had been taken.

" It must be here ! " said the King, when he saw the first door with a cross upon it.

" No, it is there, my dear husband ! " said the Queen, pointing to the second door with a cross upon it.

" But there is one here, and there is one there ! " cried all the courtiers. Wherever they looked there were crosses on the doors. So they soon saw that it was no good searching farther.

But the Queen was a wise woman, who could do much more than merely ride out in a coach. She took her large gold scissors, snipped a large piece of silk into small bits and sewed them into a pretty little bag ; this she filled with small fine grains of buckwheat, fastened it to the Princess's back, and when this was done, she cut





"I won't have it!" said the King, but the biggest dog took both him and the Queen and hurled them ever so much farther than all the others.

a little hole in the bag so that the grains might dribble through along the whole way the Princess went.

At night the dog came again, took the Princess on his back, and ran with her to the soldier, who had grown so fond of her that he longed to be a Prince that he might have her as his wife.

The dog did not notice how the grains were dribbling all the way from the Palace to the soldier's dwelling, as he ran right up the wall with the Princess, so in the morning the King and Queen saw at once where their daughter had been ; and they had the soldier seized and put him into prison.

There he sat. Ugh ! how dark and horrid it was, and they said to him, " To-morrow you shall be hanged ! "

This was not a pleasant thing to hear, especially as he had forgotten his tinder box and left it at the inn. In the morning he could see through the iron bars of the little window all the people hastening out of the town to see him hanged. He heard the drums beating and saw the soldiers marching. Every one was running that way as fast as they could. Among them was a cobbler's lad with his leather apron and slippers ; he was running at such a rate that one of his slippers

flew off right against the wall where the soldier was peeping between the iron bars.

"Hi! you cobbler-lad, don't be in such a hurry!" cried the soldier. "Nothing will take place till I arrive, but if you will just run over to where I have been living and fetch me my tinder box, you shall have five copper pieces, but you must go as quickly as your legs will carry you" The cobbler's lad wanted the money very much, so off he ran for the tinder box, gave it to the soldier, and—yes, now you *shall* hear something!

Outside the town a large gallows had been erected, and round about it stood the soldiers and thousands of people. The King and Queen sat on a beautiful throne right opposite the Judge and the whole Council.

The soldier already stood on the ladder, but just as they were about to throw the cord round his neck, he observed that it had always been the custom for a criminal to be granted one innocent wish before he suffered death. He would so much like, he said, to smoke a pipe of tobacco—it was, after all, the last pipe he would ever smoke in this world!

The King did not like to say "No" to that, and so the soldier took out his tinder box and struck a light—once—twice—and thrice. And there

came all the dogs, the one with eyes as big as tea-cups, the one with eyes as big as mill-wheels, and the one with eyes as big as towers

“Save me from being hanged!” said the soldier, and with that the dogs rushed upon the Judges and the whole Council, took some by the legs and others by the nose and flung them up high into the air so that they fell down and were dashed to pieces.

“I won’t have it!” said the King; but the largest dog took both him and the Queen and hurled them ever so much farther than all the others. Then the soldiers grew frightened and all the people cried, “Good soldier, you shall be our King and marry the pretty Princess!”

So the soldier sat in the King’s carriage, and all three dogs ran in front and barked, “Hurrah!” The boys whistled through their fingers, and the soldiers presented arms. The Princess came out of the copper castle and became Queen, and really very much liked it. The wedding feast lasted eight days, and the dogs sat at table and made big eyes and stared with all their might.

## THE CANDLES

**T**HERE was a large wax-light which had a very good opinion of itself

"I was born in wax and shaped in a mould," it said; "I shine better and burn longer than other lights, my place is in the chandelier or the silver candlestick!"

"That must be a delightful existence!" said the tallow-candle "I am only of tallow, only a dip, but I always console myself with the reflection, that at any rate, I am something more than a rush-light, *that* is only dipped twice, whereas I am dipped four times to give me my proper thickness I am quite satisfied, no doubt it is luckier and more genteel to be born in wax and not in tallow, but one does not order one's place in the world *They* get into the glass chandelier in the dining-room I remain in the kitchen, but the kitchen is a good place too; the whole house gets its food thence"

"But there is something more important than food," said the wax candle "Society! To see people shine and to shine one's self! There will be a ball here this evening Now you'll

see that I and all my family will be sent for immediately!"

Scarcely had this been said when all the wax-candles were sent for, but the tallow-candle came along with them also. The lady of the house herself held it in her dainty hand and carried it into the kitchen; there stood a little lad with a basket which was filled with potatoes and a couple of apples were there too. All this the good lady gave to the poor boy.

"And there's a candle for you as well, my little friend!" said she; "your mother sits and works right through the night; she can make use of it!"

The little daughter of the house stood close by and when she heard the words "right through the night," she said with heartfelt joy: "I shall be up all night, too; we are going to have a ball, and I shall have my large red bows on" How her face beamed! It was joy! No wax candle can shine like those child-eyes!

So the tallow candle was laid beneath the basket-lid and the boy went away with it

"I wonder whither I am going now!" thought the candle. "I am on my way to poor people; perhaps I shall get a brass holder, while the wax-candle sits in silver and sees the most elegant

people. How delightful it must be to shine before the grand folk. But it is my lot to be tallow, not wax!"

And the candle came to the poor people, a widow with three children in a little low room right opposite the rich house "God bless the good lady for what she gave!" said the mother; "'tis really a lovely light! It may last the whole night." And the candle was lit.

"Fut-foi!" it spluttered. "That *was* a nasty-smelling sulphur-match she lit me with! That's not the sort of thing they would be likely to offer the wax-candle in the rich house over the way!"

There, too, candles were lit, they shone over the street; the carriages rumbled along with the smartly dressed ball-guests and the music sounded.

"Now they are beginning over there," said the tallow-candle, and it thought of the little rich girl's beaming face, more beaming than all the wax lights "I shall never see *that* sight again!"

Then the smallest of the children of that poor house came in, a little girl. She put her arms round the necks of her brother and sister; she had something very important to tell them, so important that it must be whispered: "This—

evening—we are going to have only fancy!—we are going to have *hot potatoes!*"

And her face beamed with delight, the candles shone right upon it, it saw there a joy, a happiness, as great as in the rich house yonder where the little girl had said, "We are to have a ball this evening! and I shall have the large red bows on!"

"Is it such a great thing to have hot potatoes!" thought the candle, "there's just as much joy among the little ones here as over there!" And it sneezed on the strength of it, that is to say it spluttered, which is as much as a tallow-candle *can* do. The table was laid, the potatoes were eaten. Oh! how nice they tasted! It was quite a banquet, and every one got an apple into the bargain, and the smallest child of all said the following little verse

"Thou God so good, my thanks to Thee  
That Thou hast given food to me! Amen"

"Wasn't that nicely said, mother?" exclaimed the little one immediately afterwards

"You must not ask or say such things!" said the mother, "you should merely think upon the good God who has fed you!"

The little ones were got to bed, were kissed and went straight off to sleep and the mother sat

and sewed till late into the night to make both ends meet both for herself and for them. And the candles shone from the rich house over the way, and the music sounded. The stars twinkled over all the houses, as brightly on the poor as on the rich: there was no difference.

“ That was a capital evening after all’s said ! ” opined the tallow-candle. “ I suppose the wax-candles had a better time of it in the silver candlestick ! I should so like to know that before I burn down to the socket ! ” And it thought of the pair of happy children, the one that was lit by the wax-candle and the one that was lit by the tallow-candle !

## THE SNOW QUEEN

### IN SEVEN STORIES

#### FIRST STORY—WHICH TELLS OF THE MIRROR AND THE SPLINTERS

**L**OOK! Now we'll begin. When we have got to the end of the story, we shall know more than we do now, for it was a wicked gnome, it was the very worst of the lot, it was, in fact, the Evil One himself.

One day, when he was in a good humour, he made a looking-glass which had this peculiarity, that everything good and fair which mirrored itself therein vanished into next to nothing, but what was of no good, or was foul to look upon, stood right out and became still worse. In this mirror the loveliest landscapes looked like cooked spinach and the best men became ugly or stood upon their heads; faces were so distorted that no one could recognize them, and anyone who had a freckle might be quite certain that it would appear as if it ran right over nose and mouth. If a good pious thought passed through a man's mind, such a grimace would appear in the mirror that the Evil One laughed fit to split at his cunning invention.

All those who went to the Gnome School kept by the Evil One proclaimed far and wide that a miracle had happened ; now, at last, said they, one could see how the world and mankind really looked. They ran about with the mirror till there was not a land or a person which had not been distorted on its surface.

And now they wanted to fly up to Heaven itself and make fun of the angels. The higher they flew with the mirror, the more broadly it grinned—in fact, they could scarcely hold it. Higher and higher they flew, nearer to the sun, and then the mirror shook so frightfully that it flew out of their hands and plunged down upon the earth, where it was smashed into millions and billions of pieces.

Thus it worked even more mischief than before, for some of the pieces were no larger than grains of sand, and these flew about the world, and whenever they got into people's eyes there they stayed and people saw all things distorted or had eyes for nothing but what was improper in a thing, for every tiny grain of glass possessed the same power that the mirror had as a whole. Some men even got a little looking-glass splinter in their hearts, and the result was shocking, for their hearts immediately became like lumps of ice.

Some of the splinters were so large that they were used for window panes, but it was not right to view one's friends through these panes. Other pieces were made up into spectacles, and when people put such spectacles on to see better and be fair and just, a pretty mess they made of it. The Evil One laughed till his sides shook, the whole thing tickled him so deliciously. But yet other little splinters flew up into the air, as you shall presently hear.

#### SECOND STORY—A LITTLE BOY AND A LITTLE GIRL

In a large city where there were so many houses and men that there was no room for every one to have a little garden of his own, so that most people had to be content with flowers in pots, there were nevertheless two poor children who had a garden a little bigger than a flower-pot. They were not brother and sister, but their parents dwelt close to one another, in two little rooms close under the roofs where the roof of a neighbouring house joined on to theirs. A gutter ran all along beneath the eaves. In each house was a little window; one had only to step over the gutter to get from one window to the other.

Each family had outside a large wooden box,

in which they grew pot herbs for their own use, and a little rose tree. There was one in each box and they grew splendidly. The two families now hit on the plan of placing the boxes crossways over the gutter, so that they nearly reached from one window to the other and looked exactly like two flower-beds. The tendrils of the plants hung down over the boxes and the rose-trees shot forth long branches round the windows and leaned over to one another; it was almost a triumphal arch of flowers and leaves. As the boxes were very high and the children knew they must not climb up to them, they got leave to sit on their small stools beneath the rose-trees, and there they played together prettily and happily.

In winter this pleasure ceased. The windows were often frozen, but then they warmed copper pieces on the stove, laid the hot coin on the frozen pane, and then there was such a nice round hole to peep through. Behind the hole peered such a nice gentle eye, one from each window; it was the little boy and the little girl looking at each other. He was called Kay and she was called Gerda. In summer they could get at each other with a single step, but in winter they had first to go down a lot of stairs and then up another lot of stairs.

Outside, the snowflakes were falling.

" 'Tis the white bees swarming ! " said the old grandmother.

" And have they a queen bee ? " asked the little boy, for he knew there is always a queen bee among real bees.

" That they have ! " said the grandmother " She flies where they swarm the thickest. She is the biggest of them all and she never rests still upon the earth but flies up again in the black cloud. On a winter's night she flies through the streets of the town and peeps in at the windows, and then they freeze into all sorts of odd shapes and look like flowers."

" Yes, I have seen that ! " said both the children, and they knew that it was true.

" Can the Snow Queen come in here ? " asked the little girl.

" Let her come if she dares," said the boy ; " and I'll put her on the stove and she will melt."

But the grandmother smoothed his hair and told them other tales.

In the evening, when little Kay was in his own home and half undressed, he crept up on to the chair by the window and peeped out of the little hole ; a few snowflakes were falling and one, the largest of all, remained lying on the corner

of one of the flower-boxes ; as he watched, the snowflake grew larger and larger till at last it became a full-grown lady, clad in the finest white gauze, that seemed to consist of millions of starry crystals. She was fair and fine, but of ice—dazzling, sparkling ice Yet she was alive , - her eyes sparkled like two bright stars, but there was no rest or peace in them.

She nodded towards the window and beckoned with her hand The little boy was frightened and sprang down from the chair ; and then it was as if a huge bird flew past the window outside.

Next day there was a hoar-frost—then it thawed—and at last the spring came. The sun shone, the green things peeped forth, the swallows built their nests, the windows were opened, and the children again sat in their little garden high up on the roof above all the other storeys.

The roses blossomed very beautifully that summer. The little girl had learnt a hymn and in it there was something about roses, and these roses made her think about her own, and she sang the hymn to the little boy and he sang it with her :

“ The roses bloom but one short hour, then die,  
But the infant Jesus ever lives on high ”

And the little ones held each other by the

hands, kissed the roses and looked up at God's bright sunshine and talked as if the Child Jesus were there. What beautiful summer days they were ; it was so delightful to be near the sweet rose-trees, which seemed as if they would never cease blooming.

Kay and Gerda sat looking at their picture-book of birds and beasts, when, just as the church clock struck five, Kay suddenly cried out, "Oh, it stabbed me in the heart, and now I have something in my eye ! "

The little girl threw her arms round his neck, he blinked with his eyes, but there was nothing to be seen in them.

" I think it has gone," said he, but gone it had not. It was one of those bits of glass which had sprung from the mirror, the magic mirror, you recollect, that nasty glass which made everything great and good look ugly and petty, but made the bad and disagreeable stand out plainly, while every fault in a thing was immediately seen. Poor Kay had also got an atom right in his heart. Soon it would become like a lump of ice. At present it did no harm, but it was there.

" Why do you cry ? " he asked. " You'll only make yourself ugly. There's nothing amiss with me ! Fie ! " he cried suddenly, " this rose is

gnawed by a worm, and look ! that one is quite crooked ! They are really very ugly roses, after all. They are like the boxes they stand in ! " And he gave the boxes a kick and tore off two of the roses.

" Kay ! what are you doing ? " cried the little girl, and when he saw her dismay he tore off yet another rose and ran back to his own window and away from sweet little Gerda.

When she came afterwards with the picture-book, he said it was only fit for babies, and when his grandmother told them tales, he would be sure to come out with a " *but*—nay " whenever he was able. He would go behind her, put on her spectacles and imitate her talk ; it was so exactly like her that people used to laugh when they heard him. Soon he could imitate the talk and gait of all the people who lived in the street. Everything that was odd and not nice about them Kay could imitate, and so folk began to say, " That lad has a head upon his shoulders, there is no doubt about it ! " But it was the picce of glass in his eye and the picce of glass in his heart that made him tease even little Gerda, who loved him with her whole soul.

His games were now different from what they had been ; they were more like a grown up

person's amusements One winter's day, as the snowflakes were whizzing down, he came with a large magnifying-glass, held the lappet of his coat out and let the snowflakes fall upon it.

"Now look through the glass, Gerda!" said he, and every snowflake was much bigger and looked like a splendid flower or a ten-cornered star, it was such a pretty sight!

"Look how lovely it is," said Kay, "it is much more interesting than to have to do with real flowers! And there is not a single flaw in them, they are exact. If only they wouldn't melt!"

Shortly afterwards came Kay with big gloves on and his sledge at his back. He bawled into Gerda's ear, "I have leave to drive about in the great square where the others are playing," and off he went.

Down in the square the boldest lads tied their sledges fast to the farmers' carts and thus drove a good distance with them It was jolly fun

When the play was at its height a large sledge came driving along. It was painted white and in it sat a person wrapped round in a fleecy white pelisse with white fleecy hood, the sledge drove round the square twice and Kay quickly tied his little sledge to it and so dashed along with it.

It went quicker and quicker right into the next street. The driver turned his head and nodded in a friendly way to Kay, it was just as if they were old acquaintances. Every time Kay would have unfastened his little sledge, the driver nodded again, and so Kay remained sitting where he was and they drove right out of the city gates.

Then the snow began to pour down so that the little boy could not see an inch before his nose as he rushed along. Presently he slipped the rope to get loose from the large sledge, but it was of no use; his little vehicle clung fast, and away they went like the wind. Then he screamed out loudly, but no one heard him; the snow-flakes still fell and the sledge still flew along; now and then the sledges gave a leap as if they were going over hedges and ditches. He grew frightened, and would have said "Our Father," but he could only recollect his multiplication table.

The snowflakes grew bigger and bigger; at last they looked like large white hens. All at once they sprang on one side; the large sledge stopped and the person who was riding in it got up. Her pelisse and hood were of snow; and he saw a tall and slender lady of dazzling whiteness—and this was the Snow Queen.

As he watched through the window the snow-flake grew larger and larger till at last it became a full-grown lady, clad in the finest white gauze, that seemed to consist of millions of starry crystals. She was fair and fine, but of ice—dazzling, sparkling ice.





"We have made good progress," said she, "but it is freezingly cold, isn't it? Creep in under my bear-skin mantle!" and she took him into the sledge with her and wrapped her pelisse round him; it was as if he sank into a snow-drift

"Are you still freezing?" she asked, and then she kissed him on the forehead. Ugh! the kiss was colder than ice, it went right to his heart, half of which indeed was ice already; he felt as if he must die—but only for an instant. After that he was well again; he no longer felt the cold all round about

"My sledge! don't forget my sledge!" that was the first thing he thought of. It was tied to one of the white hens and flew on after the sledge upside down. The Snow Queen kissed Kay once more and then he forgot little Gerda and his grandmother and every one at home.

"And now you'll get no more kisses," said she, "for I might kiss you to death!"

Kay looked at her. She was so fair. A wiser, lovelier face he could not imagine. She did not seem to be of ice, as when she had sat outside the window and beckoned to him. In his eyes she appeared perfect, and he did not feel in the least frightened.

He told her that he was good at mental arithmetic, including fractions, that he knew the area in square miles of all countries and how many inhabitants they had, and she smiled at all he said. And then he bethought him that what he knew was not enough after all and he looked up into the vast sky, and she flew with him, flew right up into the black clouds, and the storm sighed and moaned as if it were singing old, old songs. They flew over wood and tarn, over sea and land; down beneath them roared the cold blast, the wolves howled, the snow sparkled and away over it flew the black, cawing crows; but high above them shone the moon, large and bright, and Kay gazed at it throughout the long, long, winter night. In the daytime he slept at the feet of the Snow Queen.

### THIRD STORY—THE FLOWER GARDEN OF THE DAME WHO KNEW MAGIC

But how fared it with Gerda when Kay came no more? And where was he? Nobody knew, nobody could make it out at all. The boys merely said that they had seen him fasten his little sledge to a splendid big one which turned into a side street and went out of the city gate. Nobody knew where he was; many tears flowed,

and Gerda wept deep and sore. Then people said that he was dead, that he had fallen into the river which ran close by the town. Oh! the winter days were long and dark and dreary.

At last came the spring and the sunshine

"Kai is dead and gone!" said little Gerda.

"I don't believe it!" said the sunshine.

"He is dead and gone!" said she to the swallows

"We don't believe it," answered they, and at last Gerda did not believe it herself

"I will put on my new red shoes," she said one morning. "Kai has never seen them, and then I'll go down to the river and ask about him!"

It was quite early; she kissed her old grandmother, who was asleep, put on the red shoes and went alone out of the city gate to the river.

"Is it true that you have taken my little playfellow? I will give you my red shoes if you will let me have him back again."

It seemed as if the waves nodded strangely. Then she took off her red shoes, the most precious things she had, and cast them both into the flood, but they fell close to the shore and the little waves at once bore them back to her. It was as if the river would not accept the most precious things she had, especially as it really had

Gerda crept into a boat which lay amongst the rushes, went to the farthest end of it, and then threw the red shoes, the most precious things she had, out again, but the boat was not bound fast and at the movement glided from the shore.





not got little Kay to give in exchange. But now she fancied she had not cast the shoes out far enough, and so she crept into a boat which lay among the rushes, went to the farthest end of it and then threw the shoes again. The boat was not bound fast and at the movement glided from the shore. She perceived this, but before she could get back the boat was out in the stream and gliding swiftly along.

Then Gerda grew frightened and gave herself up to weeping, but no one listened to her but the sparrows, and they couldn't carry her back to land. But they flew along the banks and sang, as if to comfort her, "Here be we! here be we!" The boat drifted with the stream. Gerda sat in her bare stockings; her red shoes floated after her, but they could not reach the boat, it went so much faster.

It was beautiful on both banks, lovely flowers and old trees and meadows with sheep and cows, but not a human being was to be seen.

"Perhaps the river will carry me to Kay!" thought Gerda, and so she plucked up her spirits, sat up and looked for many hours at the pretty green banks. Presently she came to a large cherry garden, where there was a little house with wonderful red and blue windows, a straw-thatched

roof and two wooden soldiers outside who presented arms to all who sailed by.

Gerda called to them. She fancied they were alive, but, naturally, they did not reply, she came close to them, and the current drove the boat towards the shore.

Gerda called still more loudly and out of the house came an old, old woman who leaned upon a crooked stick, she had a large straw hat on her head, and it was painted with the loveliest flowers.

" You poor little child ! " said the old woman, " how did you get out on the big, strong stream that has carried you so far into the wide world ? " So the old woman went into the water, hooked the boat with her stick, brought it ashore and lifted Gerda out.

Gerda was glad to find herself on dry land again, and yet was a little afraid of the strange old dame.

" Come and tell me who you are and how you got here ! " said she.

Gerda told her everything, and the old woman shook her head and said · " Hm ! hm ! " When Gerda had told her everything and asked if she had not seen little Kay, the dame said he had not yet passed that way, but he would come

right enough. She must not give way to grief but taste her cherries and look at her flowers, which were prettier than any picture-book, every one of them could tell a story of its own. So she took Gerda by the hand, and they went into the house and the old woman locked the door.

The windows were very high up and the panes of glass were red, blue and yellow, so that the daylight seemed to have all the colours of the rainbow. But on the table stood the loveliest cherries, and Gerda ate as many as she liked. While she was eating the old dame combed her hair with a golden comb, and her hair curled and looked beautifully glossy round the little kindly face, which looked as round and fresh as a rose.

"I have been longing for such a sweet little girl as you," said the old woman. "Now you shall see what a nice time we two shall have together." And all the while she kept combing Gerda's hair, and Gerda forgot her foster-brother Kay more and more. The old dame was versed in magic arts, but was not really wicked, she merely practised a little magic for her own amusement, and now she very much wanted to keep little Gerda. So she went into the garden, stretched her crooked stick towards the rose-trees, and, beautifully as

they all were blooming, the whole sank into the black earth, so that one could not make out even the places where they had stood. The old dame was afraid that when Gerda saw the roses she would think of her own, and so remember Kay and run away.

Now she led Gerda into the flower-garden. What fragrance and loveliness were there! All imaginable flowers and of every season stood in the most gorgeous bloom; no picture-book could be so bright and gay. Gerda jumped for joy, and played till the sun went down behind the tall cherry trees; then she went to sleep in a lovely bed with silk pillows stuffed with violets, and slept and dreamed as nicely as any queen on her wedding day.

Next day she played again with the flowers in the warm sunshine, and so it went on for many days. Gerda knew every flower, but, many as they were, it seemed as if one were wanting, but she could not think which it was. As she was sitting one day, she looked up at the old dame's sun-bonnet with the painted flowers, and the loveliest of all was the rose. The old dame had forgotten to take it off her hat when she made the others go down into the ground. But that's what it is not to have one's wits about one!

"What!" cried Gerda, "are there no roses here!" and she ran among the beds and searched and searched, but there were none to be found. Then she sat down and wept, but her hot tears fell on the exact spot where the roses had sunk, and wherever the tears moistened the ground a tree immediately shot up as full of bloom as when it sank, and Gerda embraced it, kissed the roses, and thought of the lovely roses at home and of little Kay.

"Oh! how sluggish and backward I have become!" said the little girl. "Why, I ought to be finding Kay! Do you not know where he is?" she asked the roses. "Do you think that he is dead?"

"He is not dead," answered the roses "We have just been in the earth, haven't we? Well, there are all the dead, but ay was not there!"

"Thank you!" said Gerda, and she went to the other flowers and looked into their cups and asked, "Do you know where little Kay is?"

But every flower stood in the sun, dreaming its own experience or history. Many, many were the tales Gerda got from them, but none knew anything of Kay.

And what, then, did the Lily say?

"Do you hear the drum, 'Boom! boom!'

there are only two notes, always ' boom ! boom ! ' Listen to the weeping of the women, listen to the cries of the priests In her long red garment stands the Hindu widow on the funeral pile, the flames flicker around her and her dead husband , but the Hindu woman thinks of the living, of him whose eyes shine brighter than the flames, of him the fire of whose eyes is nearer to her heart than the flames which will soon burn her body to ashes. Can the flames of the heart die in the flames of the funeral pile ? "

" I don't understand it a bit ! " said Gerda.

" That is my story ! " said the Lily.

What did the Convolvulus say ?

" Over the narrow mountain path hangs an old feudal castle ; the thick ivy grows up around the old red walls, leaf by leaf, round the balcony, and there stands a lovely maiden ; she bends over the trellis-work and looks down the path. No rose hangs fresher from the branches than she , no apple blossom, when the wind bears it away from the tree, is lighter than she ; how the splendid silk kirtle rustles ! Won't he come after all ? "

" Is it Kay you mean ? " asked Gerda

" I am only telling my own story, my dream, " answered the Convolvulus.

Then what did the Snow-Drop say ?

" Between the trees a long board hangs on the rope, it is a swing ; two nice little girls (their frocks are as white as snow and long, green, silk ribbons flutter from their hats) are swinging ; their brother, who is bigger than they, stands up in the swing , he has his arm round the rope to hold on by, for in one hand he has a bowl and in the other a clay pipe ; he is blowing soap-bubbles , the swing rocks and the bubbles fly with pretty, shifting colours ; the last of them is still hanging to the bowl of the pipe and swaying in the wind ; and the swing rocks to and fro. The little black dog, as light as the bubbles, stands on his hind legs and wants to get into the swing too It flies along, the dog plumps down, barks, and is angry , it is fooled, the bubbles burst—a swinging board, a dancing soap-bubble, that is my song ! "

" What you tell me is very pretty, I can quite believe , but you say it so sadly and don't mention Kay at all. What do the Hyacinths say ? "

" There were three lovely sisters, so transparent and delicate , the first had a red kirtle, the second a blue, and the third a white ; hand in hand they danced by the silent lake in the bright moonshine. They were not elves, they were daughters of the earth. There was such a sweet

fragrance, and the girls vanished in the wood. The fragrance grew stronger ; three coffins, in which lay the beautiful girls, glided from the thicket, right across the lake ; fire-flies, like tiny candles, flew shining round about them. Do the dancing girls sleep, or are they dead ? The fragrance of the flowers says they are dead ; the vesper bell is tolling for them."

" You make me quite sad ! " said Gerda. " Your fragrance is so strong that I cannot help thinking of the dead damsels ! Alas ! is little Kay really dead then ? The roses have been down in the earth, and they say ' O ! ' "

" Ding, dong ! " rang the bells of the Hyacinths. " We are not ringing a knell over little Kay, we don't know him ; we do but sing our own song, the only one we know ! "

And Gerda went to the Buttercup, which shone out from among the glistening green leaves.

" You are a bright little sun ! " said Gerda ; " tell me if you know where I shall find my playfellow ! "

The Buttercup shone so nicely and looked at Gerda again. What song would the Buttercup sing ? Well, it had nothing to say about Kay either.

" The bright sun was shining warmly down





Gerda knew every flower, but, many as they were, it seemed as if one were wanting, but she could not think which it was. As she was sitting one day she looked at the old dame's sunbonnet with the painted flowers, and the loveliest of all was the rose.

upon a little farm-yard on the first day of spring. The sunbeams glided down the neighbour's white wall, and close beside it grew the first yellow flowers, shining like gold in the warm sunbeams. The old grandmother was out in her chair, her granddaughter, the poor and pretty serving-maid, came home for a short visit, she kissed her grandmother. There was gold, the gold of the heart in that blessed kiss. Gold on the mouth, gold at the bottom of the heart, gold in the early morning. There! that's my little story!" said the Buttercup.

" My poor old grandmother!" sighed Gerda. " Yes, I know she's longing for me, and is grieved on my account just as she was for Kay. But I'll soon come home again, and then I'll bring Kay with me. It is no good asking the flowers, they can only sing their own songs, they cannot tell me anything!" So she tied up her little frock that she might be able to run the quicker, but the *arcissus* struck her on the leg as she jumped over it; then she stood still, looked at the flower, and said. " Perhaps you may have something to tell me, eh?" and she bent down over it. And what did it say?

" I can see myself! I can see myself!" said the *Narcissus*. " Oh! oh! how nicely I smell!

Up in a little garret, half-dressed, is a little dancing girl. Now she stands on one leg, now she stands on two, she has a kick at the whole world, she is only deceit from head to foot. She pours water out of the teapot on a bit of stuff she holds; it is her bodice. Cleanliness is a good thing. The white frock hangs upon a peg, it also is washed in the teapot and dried on the roof! She puts it on, and puts on a saffron apron that the frock may look more white. Leg in the air! How she struts upon her stalk! I can see myself, I can see myself!"

"I don't care about that a bit!" said Gerda, "that's not the sort of thing you should tell me!" and she ran away to the very end of the garden.

The door was locked, but she shook the rusty clasp till the door sprang open, and Gerda ran out with bare feet into the wide world. She looked back three times, but nobody was coming after her. At last she could not run any more and sat down on a large stone, and when she looked around her summer was over, and it was late in the autumn. She had not been able to observe this at all in the beautiful garden, where there were always sunshine and the flowers of every season.

" Dear me ! what a sluggard I am ! " said little Gerda. " The autumn has come ! I must not rest ! " and so she rose to go farther.

Her tiny feet were tender and tired, and everything about her looked so cold and raw. The long willow-leaves were yellow ; the mist fell from them in drops, one leaf came down after the other, only the sloe-thorn stood there with all its fruit, so stiff it looked, enough to make one's mouth wry. Oh how heavy and grey seemed the whole wide world !

#### FOURTH STORY—THE PRINCE AND PRINCESS

Gerda had to rest again ; then there came hopping over the snow right opposite to where she sat a large crow ; it had been sitting a long time, looking at her and wagging its head, now it said : " Caw ! caw ! Goo' day, goo' day ! " It could not express itself better, but it was well disposed towards the little girl—asking her whether she was going, all so lonely, out into the wide world. The word " lonely " Gerda understood very well, and she felt keenly how much there lay in it, so she told the crow the whole story of her life and asked if it had not seen Kay.

The crow nodded thoughtfully, and said : " May be—may be ! "





There came hopping over the snow right opposite to where she sat a large crow. It said : "Caw ! caw ! Goo' day, goo' day ! "

"What? You really think so?" cried the little girl, and she nearly squeezed the crow to death, so fondly did she kiss him.

"Steady, steady!" said the crow. "I think it may possibly be little Kay! but he has certainly forgotten you by this time for the Princess."

"Is he living at a Princess's?" asked Gerda.

"Yes, listen," said the crow; "but I find it so hard to talk your language. If only you understood crow language, I could tell it you better."

"No, I have not learnt that!" said Gerda, "I only wish I knew it."

"It doesn't matter," said the crow. "I will tell the story as well as I can, but it will be poor at best;" and so it told what it knew.

"In the kingdom where we are now dwells a Princess who is so very wise. She has read all the newspapers in the world, and forgotten them again, so wise is she. The other day she was sitting on the throne, and things might be merrier there than they are, people say, when she began to hum a tune, it was just this one—

"'Wherefore then should I not marry?'

"'There's something in that now!'" said she, and so she determined to get married, but she wanted a husband who had something to say for himself when people spoke to him, not one who

could only stand still and look grand, for that is so tiresome. Then she had all her Court ladies brought together by the beating of a drum, and when they heard what she wanted they were ever so pleased.

"'How very nice!' said they, 'we were thinking much the same thing ourselves the other day!' I assure you every word I say is true!" said the crow. "I have a tame sweetheart who hops freely about the Palace, and she told me all about it!"

His sweetheart was also a crow, of course, for a crow's mate is always a crow.

"The newspapers immediately came out with border of hearts and the Princess's initials, and there were notices in them to the effect that every young man of good appearance was free to come up to the Palace and talk to the Princess, and the one who talked so that people could see that he was at ease and talked best of all, the Princess would marry!

"Yes, yes!" said the crow, "I assure you, it is as true as that I sit here. The people came crowding in, there was a racing and a squeezing, but nothing came of it either on the first day or yet on the second. They could talk well enough, the whole lot of them, in the street, but when they

She bent one of the red leaves aside and then she saw a brown neck—Oh, it *was* Kay! She called his name quite loudly and held the lamp towards him—the dreams, on horseback, whisked into the room again—he awoke, turned his head and . . . it was *not* little Kay!





passed through the Palace gates and saw the guards in silver and footmen in gold all the way up the stairs, and the large rooms, so finely lit up, they were quite abashed. And when they stood before the throne where the Princess sat, they had not a word to say for themselves except the last word the Princess had said, which they repeated, but she did not care about hearing *that* over again. It was just as if all the people had taken snuff into their stomachs and had fallen into a swoon until they got into the street again, when they at once fell a-chattering. There stood a whole row of them from the city gates to the Palace. I went inside myself to see it all! " said the crow. " They were both hungry and thirsty, but they got nothing from the Palace, not so much as a glass of water. Some of the wisest had brought bread and butter with them, but they did not share it with their neighbours; for each thought. " Let him look hungry, and then the Princess won't have him! "

" But Kay—little Kay? " asked Gerda. " When are you coming to him? Was he among the crowd? "

" Patience, patience! We are coming to him presently. It was the third day, and then a little person without either horse or carriage came

marching jauntily up to the Palace ; his eyes sparkled like yours, and he had lovely long hair, but I must say his clothes were very shabby."

" It was Kay ! " cried Gerda rapturously. " Oh, now I have found him ! " and she clapped her hands for joy

" He had a little knapsack on his back ! " said the crow.

" No, it must have been his sledge ! " said Gerda, " for he went away with his sledge ! "

" That may be, " said the crow, " I didn't look very closely, but I heard from my tame sweetheart that when he came in at the Palace gate and saw the guards in silver and the footmen in gold along the stairs, he was not put about the least little bit, but nodded to them easily and said : ' It must be very tiresome to stand on the staircase ; I prefer to go inside ! ' There the great rooms were all ablaze with light ; the privy councillors and excellencies went about bare-footed and in nothing but gold thread ; it was enough to make anyone feel solemn and respectful ! His boots creaked dreadfully, but yet he was not frightened ! "

" That is little Kay all over ! " said Gerda. " I know he had new boots ; I have heard them creak in grandmother's room ! "

"Yes, creak they did indeed!" said the crow. "But he went boldly up to the Princess, who sat on a pearl as large as a spinning-wheel, and all the Court ladies with their maids and their maids' maids and all the lords with their gentlemen and their gentlemen's gentlemen, who each had a page to attend them, stood in state all around, and the closer they stood to the door, the prouder they looked. As for the page of the gentleman's gentleman, who always walks about in slippers, there is no looking at him, so haughtily does he stand in the doorway!"

"It must be horrible!" said little Gerda, "and did ay get the Princess after all?"

"If I had not been a crow, I should have taken her myself, although I am engaged already. He is said to have talked as well as I talk when I talk the crow's language. I had that from my tame sweetheart. He was bold and cheerful, he had not come thither to woo at all, but simply to see how clever the Princess might be, and he thought well of her and she thought well of him in return."

"Yes, I am sure it was Kay!" said Gerda. "He was so clever he could do mental arithmetic and fractions! Oh, won't you lead me up to the Palace!"

"Ah, it is very easy to talk!" said the crow,

" but how shall we manage it ? I'll talk it over with my tame sweetheart ; she will be able to advise us , but let me tell you this, such a little girl as you are will never get leave to go in ! "

" Yes, I will ! " said Gerda, " when Kay hears that I am there, he will come straight to me and fetch me in ! "

" Wait for me by the stile there ! " said the crow, and it wagged its head and flew away .

Late in the evening, when it was growing dark, the crow came back. " Caw ! caw ! " it said, " I am to greet you many times from her, and here is a little roll for you ; she took it from the kitchen , there they have bread enough and you are certainly hungry ! It is not possible for you to get into the Palace, why, you have bare feet , the guards in silver and the footmen in gold will not allow it , but don't cry, you shall come in all the same. My sweetheart knows of a little back staircase which leads to the sleeping-chamber and she knows where to find the key."

So they went into the garden, into a long alley where leaves were falling one after another. And when the lights in the Palace were put out, the crow led little Gerda towards a back-door which stood ajar.

Oh ! how Gerda's heart beat with longing and

anxiety. It was as if she were about to do something wrong, and all she really wanted was to know whether it was little Kay. Yes, it must be he ; she thought so vividly of his wise eyes and his long hair , she could see him smile quite plainly as when they used to sit at home together beneath the roses He would surely be glad to see her, to hear what a long way she had come for his sake and to know how distressed they had all been at home when he did not come back. Oh, how happy and how frightened she was at the same time !

And now they were on the staircase A lamp was burning in a little cupboard. In the middle of the floor stood the tame crow and turned its head on all sides and looked at Gerda, who curtsied as her grandmother had taught her.

“ My betrothed has spoken so nicely of you, little miss,” said the tame crow ; “ and your story is very touching. If you will take the lamp, I will walk ahead. We go straight on, for we shall meet no one ! ”

“ It seems to me that some one is coming behind us ! ” said Gerda, and something whizzed past her. It was like shadows on a wall, horses with flowing manes and thin legs, huntsmen and lords and ladies on horseback

" Those are only dreams," said the crow, " they come and fetch away to the chase the thoughts of our high and mighty master and mistress. It's a good thing, too, for you will be able to see them in bed all the more safely. But remember ! when you have risen to honour and dignity, show that you have a grateful heart ! "

" What's the good of talking like that ? " said the crow from the wood.

And now they came into the first chamber, which was of rose-coloured satin with artificial flowers along the walls ; here the dreams whisked past them, but they went so quickly that Gerda could not see the high and mighty master and mistress. Each room was more splendid than the one before it ; it was indeed enough to bewilder anyone, and now at last they reached the sleeping chamber. The roof of it was like a large palm with leaves of costly crystal, and in the middle of the floor, on a thick gold stalk, hung two beds, which looked like lilies : one was white and in it lay the Princess ; the other was red, and in that Gerda went to look for little Kay. She bent one of the red leaves aside and then she saw a brown neck—Oh, it *was* Kay ! She called his name quite loudly and held the lamp towards him—the dreams, on horseback, whisked into

the room again—he awoke, turned his head and  
. it was not little Kay !

It was only on the nape of the neck that the Prince resembled him, but he also was young and handsome Then the Princess peeped forth from the white lily bed and asked what was the matter. Then little Gerda wept and told her whole story and all that the crows had done to help her.

“ You poor little thing ! ” said the Prince and Princess, and they praised the crows and said they were not at all angry with them, but that they must not do such things again Nevertheless they should have a reward.

“ Would you like leave to fly wherever you like ? ” asked the Princess, “ or would you prefer a fixed appointment as Court crows with all the leavings of the kitchen as your perquisites ? ”

! And both the crows bowed low and begged for a fixed appointment ; for they thought of their old age and said “ it was so nice to have something for the old days,” as they expressed it.

Then the Prince rose up from his bed and let Gerda sleep in it ; more than that he could scarcely do. She folded her little hands and thought . “ How good men and animals are after all ! ” and then she closed her eyes and slept blissfully. All the dreams came flying in

again and they looked now like angels and they drew a little sledge and on it sat little Kay and nodded. But the whole thing was only a dream and vanished the moment she awoke.

Next day she was dressed from head to foot in silk and velvet, and was commanded to stay at the Palace and enjoy herself. But she begged instead that she might have a little carriage with a horse in front and a pair of little boots that so she might go out into the wide world again and look for Kay.

And she got not only boots but a muff ; she was nicely dressed and when she was ready to go, a new carriage of pure gold drew up before the door ; the coachman, the footmen behind, and the outriders (for there were outriders also) wore gold coronets. The Prince and Princess themselves helped her into the carriage and wished her good luck.

The wild crow, who was now married, accompanied her for the first three miles ; it sat beside her, for it could not bear travelling with its back to the horses ; the tame crow stood in the gateway and flapped its wings ; it did not go with them, for it had suffered from headache ever since it had got a fixed appointment and too much to eat. The carriage was well stocked inside with





"She shall play with me," said the little robber-girl "She shall give me her muff and her pretty frock and sleep with me in my bed!"

sugar-cubes and under the seat were fruits and ginger-bread

“ Farewell ! farewell ! ” cried the Prince and Princess, and little Gerda wept and the crow wept. And then after the first few miles the crow also said farewell, and that was the saddest leave-taking of all ; it flew up into a tree and flapped its black wings as long as it could see the carriage glancing in the bright sunshine.

#### FIFTH STORY—THE LITTLE ROBBER-GIRL

They drove through a very dark wood, but the carriage shone like a flame. It glared in the eyes of some robbers and they could not withstand such a temptation.

“ It is gold ! It is gold ! ” they cried, and rushing forward, they seized the horses, beat the little jockeys, the coachman and the footmen to death and dragged little Gerda out of the carriage.

“ She is plump, and nice, and has been fattened with nut-kernels,” said the old robber-woman, who had a long, coarse beard, and eyebrows that hung down over her eyes. “ 'Tis a morsel every bit as good as a little fat lamb ! How nice she will taste ! ” So saying, she pulled out a bright knife and it shone so that it was positively ghastly.

“ Oh ! ” cried the woman the self-same moment ;

for she was bitten in the ear by her own little daughter, who hung upon her back and was very wild and naughty.

“ You loathsome brat ! ” said the mother, quite forgetting that she was about to kill Gerda

“ She shall play with me ! ” said the little robber-girl. “ She shall give me her muff and her pretty frock and sleep with me in my bed ! ” Then she bit her mother again, so that the robber-woman leaped in the air and turned round and round and all the robbers laughed and said : “ Look how she dances with her cub ! ”

“ I will have a ride in the carriage ! ” said the little robber-girl. She insisted upon having her own way, and had it too, for she was spoilt and obstinate. She and Gerda sat in the carriage and so they drove over thorns and tree-stumps into the depths of the forest. The robber-girl was the same size as Gerda, but stronger, with broader shoulders and a dark skin, her eyes were quite black, they looked almost sorrowful. She put her arm round little Gerda’s waist and said. “ They shall not kill you so long as I am not angry with you. I suppose you are a Princess ? ”

“ No ! ” said little Gerda, and she told the story of all she had gone through and said how very fond she was of little Kay.

The robber-girl looked at her solemnly, nodded her head and said, "They shan't kill you, even if I am ever so angry with you; in that case I will do it myself!" Then she dried Gerda's tears and made her put both her hands into the pretty muff, which was so soft and warm.

And now the carriage stopped; they were in the courtyard of a robber's castle, it was cracked and crannied from top to bottom, crows and ravens flew out of the gaping holes, and big bull-dogs, every one of which looked as if he could swallow a man, leaped high in the air, but they did not bark, because it was not allowed.

In a large old smoky room, in the midst of the stone floor, blazed a large fire. The smoke rose to the ceiling and had to find its own way out as best it could. A large cauldron full of soup was simmering there and hares and rabbits were roasting on spits.

"You shall sleep to-night with me and all my little animals," said the robber-girl. "They get their meat and drink and then go off into that corner where the straw and carpets are." Over their heads, on pegs and poles, were perched hundreds of doves, which appeared to be asleep, but began to turn about when the girls came near.

"They are mine, all of them!" said the little robber-girl, and seizing the nearest she held it by the legs and shook it so that it flapped its wings wildly.

"Kiss it!" she cried and dashed it in Gerda's face. "There sit all the riff-raff of the woods!" she continued, pointing to a number of cross-bars which were driven into a hole high up in the wall "Those two, I say, are a couple of rascals, they would fly away at once if one had not tied them well up. And here stands my old sweetheart, Ba-ba!" She tugged at the horn of a reindeer which had a bright copper ring round its neck and was tied up "He too must be well looked after or he will run away Every afternoon I tickle him in the neck with my sharp knife He is so afraid of it!" And the little girl drew a long knife out of a crevice in the wall and let it glide over the reindeer's neck, the poor beast kicked and plunged, but the robber-girl only laughed and dragged Gerda down into the bed with her

"Are you going to keep the knife with you while you sleep?" asked Gerda, and looked at it rather anxiously. -

"I always sleep with the knife!" said the little robber-girl "One never knows what may happen. But tell me now over again what you told

me before about little Kay and why you went forth into the wide world ”

So Gerda told her story all over again while the wood-pigeons cooed in their cot and the other doves slept. The robber-girl put her arm round Gerda’s neck, held the knife in the other hand and snored aloud ; but Gerda could not close her eyes at all, not knowing whether she was meant to live or die The robbers sat round the fire and drank and sang, and the robber-woman became quite tipsy and turned somersaults. It was a gruesome sight for a little girl to behold.

Then the wood-pigeons cried “ Coo ! coo ! We have seen little Kay A white hen bore his sledge ; he sat in the Snow Queen’s carriage, which was driving through the forest as we lay in our nests. She blew upon us young ones and all died save us two . Coo ! coo ! ”

“ What are you saying up there ? ” cried Gerda “ Where was the Snow Queen driving ? Do you know anything about it ? ”

“ No doubt she was travelling to Lapland, where there is always snow and ice Ask the reindeer who is tied there by the cord ! ”

“ There *is* ice and snow, and there life is indeed good and glorious ! ” cried the reindeer. “ There one is free to skip about in the large glistening

valleys. There the Snow Queen has her summer palace, but her castle is up towards the North Pole, in the island of Spitzbergen."

"Oh Kay, little Kay!" sighed Gerda

"Lie still, do you hear!" said the robber-girl, "or I'll run my knife through your body!"

In the morning Gerda told her all that the wood-pigeons had said, and the robber-girl looked serious, and nodded her head saying, "'Tis all one! 'tis all one!" Then she said to the reindeer: "Do you know where Lapland is?"

"Who should know better than I?" said the beast, and its eyes sparkled. "There I was born and bred, and there I used to skip about on the snowy plains!"

"Listen!" said the robber-girl to Gerda, "you see that all our men are away, but mother is still here and here she'll stay, but towards noon she will take a drink out of her big flask and have a doze on the strength of it—and then I'll do something for you!"

She sprang from her bed, rushed towards her mother, threw her arms round her neck, pulled her beard and said, "My own sweet nanny-goat, good morning!" And her mother tweaked her nose till it became red and blue, but all that was pure affection.

The robber-girl lifted Gerda up and took the precaution to tie her fast, and even gave her a cushion to sit upon





Now when the mother had drunk from her flask and settled down to a little nap, the robber-girl went up to the reindeer and said " I should enjoy above all things the pleasure of tickling you many times more with the sharp knife, for you are so comical then, but I'll loose your cord and help you to get outside so that you may run off to Lapland But you must use your legs and carry this little girl to the Snow Queen's palace, where her playfellow is You have heard, I suppose, what she has said, for she talked loudly enough and you are always listening ! "

The reindeer leaped for joy The robber-girl lifted Gerda up and took the precaution to bind her fast, and even gave her a cushion to sit upon " Here ! " said she , " take your fleecy boots, for you'll find it cold, but the muff I will keep, it is so pretty ! All the same you shall not freeze Here are mother's long mittens, they will reach up to your elbows On with them ! Now your hands look like my mother's ! "

And Gerda wept for joy

" I can't stand your whimpering ! " said the little girl " Look happy ! D'ye hear ! Here are two loaves and a ham for you, so you won't starve " These things were then tied on to the reindeer , the little robber-girl opened the door,

and having locked up all the big dogs, she cut the cord across with her knife and said to the reindeer: "Off you go! But take good care of the little girl!"

And Gerda stretched out her hands with the great mittens on them towards the robber-girl and said "Good-bye." Then away flew the reindeer over bush and brake, through the great forest, over moor and steppe as fast as it could. The wolves howled and the ravens croaked. "Fizz! Fizz!" said the sky as if it were freezing red.

"Why, that is my dear old friend, the Northern Light!" said the reindeer. "See how it shines." So it ran along still faster, both night and day; the loaves were eaten and the ham too, and by that time they had got to Lapland.

#### SIXTH STORY—THE LAPP WOMAN AND THE FINN WOMAN

They stood still before a miserable-looking little house. The roof reached to the ground and the door was so low that the family had to creep on all fours when they wanted to go out or in. Nobody was at home but an old Lapp woman who was frying fish by the light of a train-oil lamp. The reindeer told her the whole of Gerda's

story, but he told his own first, for he considered it much more important, and Gerda was so benumbed with cold that she could not speak at all

"Alas! you poor creatures!" said the Lapp woman, "why, you have a long, long way to go yet! You must go a hundred miles into Finland, for it is there that the Snow Queen lives in the summer and burns blue lights every evening I will write a few words on a piece of dried cod (I haven't any paper) by way of introduction to the Finn woman who lives up there, she will give you better advice and information than I can"

So when Gerda had warmed herself and had something to eat and drink, the Lapp woman wrote a few words on a piece of dried cod, bade Gerda take good care of it, tied her fast to the reindeer again and then they made off with great speed

"Fizz! Fizz!" the air seemed to say All night long the lovely Northern Lights were burning And so they came to Finland and knocked at the Finn woman's door

It was hot inside, so that the Finn woman herself went about with scarcely any clothes on her back She was little and dirty-looking She immediately unloosed Gerda's clothes and took

off her mittens and boots, else she would have found the room too hot; then she put a lump of ice on the reindeer's head, and read what was written on the piece of dried cod. She read the message three times and then she knew it by heart and put the fish in the stock-pot, for it was good to eat and she never wasted anything.

The reindeer now told first his own story and then little Gerda's and the Finn woman blinked her shrewd eyes but said nothing

" You are so wise," said the reindeer; " I know you can bind all the winds of the world with a silk thread so that when the skipper loosens one knot he gets a fair wind, if he loosens the second there's a stiff breeze, and if he loosens the third and fourth it blows so that the forests fall. Won't you give this little girl a potion that she may get the strength of twelve men and so overcome the Snow Queen! "

" The strength of twelve men! " said the Finn woman, " a lot of good that would be! " And she went to a drawer and brought out a large skin roll and undid it; strange characters were written thereon and the Finn woman read till the perspiration trickled down her forehead like raindrops

But the reindeer kept begging so hard for little

Gerda, and Gerda looked with such imploring eyes full of tears at the Finn woman that she again began blinking and drew the reindeer aside into a corner, where she put fresh ice on its head and whispered.

"Little Kay is with the Snow Queen sure enough and finds everything after his heart and mind and fancies it is the best spot in the world, but that is because he has a glass-splinter in his heart and a little grain of glass in his eye. They must be removed first, or he will never be a human being again and the Snow Queen will retain her power over him."

"But can't you give little Gerda something which will give her power over these things?"

"I can't give her any greater power than she already possesses. Don't you see how great it is? How men and beasts must serve her and how well she has got on in the world, bare-legged as she is! She cannot receive any power from us, it lies in her heart, and is hers because she is such a sweet, innocent child. If she cannot reach the Snow Queen and remove the glass from little Kay herself, we cannot help her. Two miles from here the Snow Queen's garden begins and thither you can carry the little girl. Let her down by the big bush covered with red berries

which stands in the snow. Don't loiter about and gossip, but hasten back hither!"

Then the Finn woman lifted Gerda on to the reindeer's back and it ran off as fast as it could.

"Oh! I have forgotten my boots and my mittens," cried little Gerda directly she was out in the biting cold, but the reindeer dared not stop. It ran till it came to the big bush with the red berries and then it put Gerda down and kissed her on the mouth, while large, bright tears rolled down the beast's cheeks. Then it ran back again as fast as it could. There stood poor Gerda without shoes or gloves amidst the frightful, icy-cold Finland.

She ran onward as fast as she could, and was met by a whole regiment of snowflakes. They did not fall from the sky, which was clear and dazzling as the Northern Lights, but ran along the ground, and the nearer they came the bigger they grew. Gerda remembered very well how large and artfully-fashioned they had looked that time when she had looked at the snowflakes through a magnifying-glass. But here they were far bigger and more dreadful, for they were alive. They were the Snow Queen's outposts, and they had the strangest shapes. Some looked like ugly

hedgehogs, others like whole knots of snakes that stuck out their heads, and others again like little children with their hair standing on end. All were dazzlingly white, and all were living snow-flakes.

Then Gerda repeated "Our Father," while the cold was so intense that she could see her own breath, which came out of her mouth like a big cloud of smoke. This cloud of breath grew denser and denser till it took the shape of little angels, which grew bigger and bigger as they touched the ground; they all had helmets on their heads and spears and shields in their hands, they grew more and more numerous, so that by the time Gerda had finished her prayer, a whole legion of them surrounded her. They slashed with their spears at the hideous snowflakes, so that they burst into a thousand pieces, and little Gerda went, quite boldly and safely, right through them. The angels stroked her on the hands and feet and then she did not feel the cold so much, and went briskly on towards the Snow Queen's palace.

But we must now see how it had fared with little Kay. He never thought of little Gerda at all, still less did he imagine that she was standing outside the palace at that very moment.

SEVENTH STORY—THE SNOW QUEEN'S PALACE  
AND WHAT HAPPENED IN IT

The walls of the palace were of driving snow-flakes and the windows and doors were made of cutting winds. There were more than a hundred rooms, all like driven snow ; the largest stretched away for many miles All were lit up by the bright Northern Lights, and they were so large, so empty, so icy cold and so dazzling. Merriment never came hither ; there was never so much even as a little ball for the bears, where the storm could blow its trumpet and the Polar bears could dance on their hind-legs and show off their fine manners , never so much as a little card party with smacks on the mouth and pats on the paws , never so much as a coffee-party for the white fox ladies , empty, cold and dreary were all of the Snow Queen's rooms The Northern Lights blazed so plainly that one could tell exactly when they were waxing highest or waning lowest in the heavens. In the midst of the empty endless hall of snow there was a frozen lake , it was broken into a thousand pieces, but every piece resembled each of the others so exactly that it was quite a work of art ; and in the midst of the lake sat the Snow Queen when she was at home, and then she said that she





She was met by a whole regiment of snowflakes  
They did not fall from the sky, but ran  
along the ground, and the nearer they came  
the bigger they grew They were the Snow  
Queen's outposts, and they had the strangest  
shapes Some looked like ugly hedgehogs,  
others like whole knots of snakes that stuck  
out their heads, and others again like little  
children with their hair standing on end

was sitting on the Mirror of Understanding, and that it was the best mirror in the whole world

Little Kay was blue with cold, nay, almost black, yet he did not perceive it, for she had kissed the cold shivers out of him and his heart was pretty nearly a lump of ice. He was working away at some sharp, flat blocks of ice, which he was placing together in every possible way, for he wanted to make something out of them. It was just as when we take little wooden blocks and make pictures out of them. So Kay was busy forming figures, and very clever ones too. In his eyes the figures were very remarkable and of the highest importance, that was owing to the grain of glass which still lay in his eye. He formed whole figures which were so many written words, but he could never manage to form the one particular word he wanted, which was "Eternity." And the Snow Queen had said, "If you can invent that figure, you shall be your own master, and I will give you the whole world and a pair of new skates." But he could not do it

"Now I am going to whiz away to the warm lands!" said the Snow Queen, "I will go and have a peep into the black pots!" These were the fire-vomiting mountains, or volcanoes, Etna

and Vesuvius, as people call them "I will whiten them a little. It will benefit them and do good to the lemons and grapes!" And away she flew

Little Kay sat all alone in the large empty ice hall, which was miles and miles long, and looked at the blocks of ice and thought and thought till he creaked and cracked, quite stiff and still he sat, one might have fancied he was frozen to death

Then it was that little Gerda entered the palace through the large gate Biting blasts were raging, but she said an evening prayer, and then the wind lay down as if it would sleep and she entered the large, cold, empty hall of ice Directly she saw Kay, she knew him, and flung herself upon his neck, and held him fast, crying, "Kay! dear little Kay! So I have found you at last!"

But he sat still, stiff and cold Then little Gerda wept hot tears, that fell upon his breast, penetrated to his heart, thawed the lump of ice and the little mirror-splinter inside it He looked at her and she sang the hymn

"The roses bloom but one short hour, then die,  
But the infant Jesus ever lives on high"

Then Kay burst into tears, he wept so much that the grain of glass swam out of his eye He

It was so blissful that the very blocks of ice danced about with joy, and when they were tired and lay down, they lay in exactly the letters of which the Snow Queen had said that he who found them should be his own master.





knew her, and cried joyfully: "Gerda! sweet little Gerda! Where have you been so long? And where have I been?" And he looked all about him. "How cold it is here! How vast and void it is!" And he clung tightly to Gerda, and she laughed and cried for joy. It was so blissful that the very blocks of ice danced about for joy, and when they were tired and lay down, they lay in exactly the letters of which the Snow Queen had said that he who found them should be his own master, and she would give him the whole world and a pair of new skates.

Then Gerda kissed Kay's cheeks and they grew quite rosy, she kissed his eyes and they sparkled like her own; she kissed his hands and feet and he was hale and strong. The Snow Queen might now come home if she pleased, for his freedom stood written there with shining letters of ice.

And they took each other by the hand and wandered out of the huge palace, they talked of their grandmother and of the roses on the roof, and wherever they went the wind died down, and the sun burst forth. And when they reached the bush with the red berries there stood the reindeer awaiting them, it had brought a young reindeer with it whose udders were full of warm milk, and it gave the little ones to drink and then kissed

them on their mouths. They carried Kay and Gerda first to the Finn woman, who warmed them well in the hot room and found out all about their journey home, and then to the Lapp woman, who had sewn them new clothes and got her sledge ready for them.

The reindeer and the young reindeer frisked along beside them to the very border of the land where the first green shoots peeped forth, and there the little travellers took leave of the Lapp woman and the two reindeer. "Farewell!" they all said.

And the first little birds began to twitter, the forest was full of green buds, and out of the woods on a splendid horse which Gerda recognized as having been harnessed to the gold carriage came riding a little girl with a shining red cap and with pistols in her belt. It was the little robber-girl, who was tired of staying at home and now wanted to go first northward and if that did not suit her to some other part of the world. She and Gerda at once recognized each other, and delighted they were!

"You're a pretty fellow to trudge about for!" said she to little Kay. "I wonder whether you deserve that anybody should travel to the very end of the world on your account!"

But Gerda patted her on the cheek and asked about the Prince and the Princess

"They are travelling in foreign lands!" said the robber-girl

"And the crow?" asked Gerda.

"The crow is dead!" she answered. "His tame sweetheart has become a widow and goes about with a bit of black thread round its leg. She complains bitterly, and it is all nonsense! But tell me how it fared with you and how you managed to find Kay!"

Then Gerda and Kay told her all that had happened.

"Snip-snap-snorum!" said the robber-girl, and took them both by the hand and promised that if ever she passed through their town she would visit them. Then she rode forth into the wide world, but Gerda and Kay went along hand in hand, and the farther they went the lovelier the spring seemed with its flowers and verdure, the church bells rang and they recognized the high tower and the large town where they lived. They went all the way to their grandmother's door, right up the steps and into the room, and everything looked the same as it used to do. The clock said "Tick, tock!" and the hands pointed to the hour, but as they passed through

the door they suddenly perceived that they were now grown-up. The roses on the roof were in full bloom and peeped in at the open window, and there stood the tiny stools they had used as children. Kay and Gerda sat down each on their own and held each other's hands while the cold empty splendour of the Snow Queen's palace was forgotten like a painful dream. The grandmother was sitting in God's bright sunshine, reading aloud from the Bible this passage : " Except ye become as little children ye shall not enter into the Kingdom of Heaven ! "

And Kay and Gerda looked into each other's eyes, and now they fully understood the meaning of the old hymn :

" The roses bloom but one short hour, then die,  
But the infant Jesus ever lives on high "

There they both sat—grown up, yet children still—children at heart, and it was summer, warm, glorious summer.

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2. Simplify  $\frac{3 \cdot 125}{2 \cdot 75}$  of  $\frac{24}{125} + \frac{2 \cdot 2}{1 \cdot 5}$  of  $\frac{187 \cdot 5}{3 \cdot 42}$ .

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4. What decimal of 9 mds. 20 seers is  $\frac{2}{3}$  of 7 mds. 5 seers? Reduce  $\frac{5}{7}$  sq. yds. to the decimal of an acre.

5. Find the value, by Practice, of 2 tons 15 cwt. 35 lb. at £13. 6s. 8d. per ton.

6. What sum of money at 4 per cent, simple interest will secure the same income as £25475 at  $4\frac{1}{2}$  per cent.?

7. If a rupee is equivalent to 1s. 6 $\frac{1}{2}$ d., what is the price of a sovereign in rupees? If, after buying 250 sovereigns at this price, I sell them again when the rupee is equivalent to 1s. 6d., how much shall I gain or lose by the transaction?

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1. Simplify :—

$$(a) (4\frac{2}{3} - 1\frac{1}{3}) \times (3\frac{1}{2} - \frac{5}{8}) - (13\frac{1}{2} + 7\frac{1}{2}) \text{ of } \frac{3\frac{1}{2}}{1\frac{1}{8}}$$

$$(b) \frac{1 \cdot 8\frac{1}{2} + 2 \cdot 041\bar{6} + 3 - 3\frac{1}{2}}{1 \cdot 0025 + 0 \cdot 625 - 1\frac{1}{8}}$$

2. Express  $\frac{2}{5}$  of 7s. 6d. + 1.25 of 5s. - 1.545 of 9s. 2d. as a decimal fraction of £10.

3. (a) Find, by Practice, the value of 5 tons 5 cwt. 2 qr. 17 $\frac{1}{2}$  lb. at £3. 6s. 8d. per ton.

(b) Find the income on which the income-tax at 5 $\frac{1}{2}$  per rupee is £52. 1a. 4p.

4. If 50 men can do a piece of work in 12 days, working 8 hours a day, how many hours a day would 60 men have to work in order to do another piece of work twice as great in 16 days?

5. If £450 amount to £540 in 4 years at simple interest, what sum will amount to £637. 8s. in 5 years at the same rate?

6. Extract the square root of 177.1561, and of  $\frac{2}{5}$  to 3 decimal places.

### 1888.

1. Simplify  $\frac{\frac{2}{3}(\frac{1}{17} \text{ of } 3\frac{1}{2} - \frac{1}{2} \text{ of } 2\frac{1}{2})}{\frac{1}{17} \times 1\frac{1}{17} \times 1\frac{1}{17} - 1\frac{1}{17} - 2\frac{1}{2}} + \frac{\frac{1}{2} + \frac{1}{17} - \frac{1}{15}}{\frac{1}{2} \times \frac{1}{2} - \frac{1}{17} \times 1\frac{1}{17}}$ .

2. Divide 16.016 by .00143, and extract the square root of 1440.9616.

3. Add together 55.5002, 3.17, 4.506 and 75.271, and find the value of the following—7365 of £3. 6s. 8d. + 504 of £15. 12s. 6d. + 2.102083 of £5.

4. Find, by Practice, the value of 2 tons 7 cwt. 3 qr. 11 lb. at £21. 12s. 6d. per cwt.

5. A man can walk 600 miles in 35 days, resting 9 hours each day; how long will he take to walk 375 miles if he rests 10 hours each day, and walks  $1\frac{1}{2}$  times as fast as before?

6. If the interest on money be one pie per rupee per month, what is the rate per cent. per annum?

A man holds 15 $\frac{1}{4}$  shares of a bank, and receives £19. 1s. 3d. per quarter. If the interest he receives be 5 per cent. per annum, find the value of a share.

### 1889.

1. Multiply .0069347 by 7439.6
2. Divide 2100 006983 by 243.5846 correct to five places of decimals.
3. Find in any way the value of 1,347 cwt. 3 qr. and 21 lb. at £3. 17s. 10 $\frac{1}{2}$ d. per cwt.
4. Extract the square root of  $1 + (0634)^2$  to six places of decimals.
5. Find in English money the value of R100,000 at 1s. 4 $\frac{3}{4}$ d. per rupee.

### 1890.

1. Simplify  $2\frac{2}{7}$  of  $\frac{13\frac{1}{4} - 9\frac{3}{5}}{15\frac{1}{2} - 11\frac{7}{8}} \div 3\frac{2}{7} + \frac{1\frac{1}{5}}{9\frac{3}{5} - 8\frac{4}{5}}$ , and find, by Practice, the value of 3,049 articles at R7. 13s. 7d. each.
2. Divide 27 03 by .0037, and reduce  $.7\dot{5} - 1\dot{0}\dot{2} - 2\dot{7}$  to a vulgar fraction.
3. Find the cost of putting a fence round a square field whose area is 13.225 acres at R1. 12s. per yard.
4. A piece of work can be done in 72 days by 17 men working together. If after 9 days of work those are joined by 4 others, in how many days will the work be finished?
5. Find the price of 4 $\frac{1}{2}$  per cent. Government Promissory Notes when an investment of R59,422. 8s. produces a monthly income of R213. 12s.

### 1891.

1. Simplify the following expression:—

$$(a) \frac{\frac{2}{3} - \frac{2}{7} + \frac{5}{14} - \frac{13}{21}}{\frac{8}{9} - \frac{2}{3} + \frac{5}{7} - \frac{13}{14}}$$

$$(b) \frac{\frac{1}{2}}{4 - \frac{\frac{1}{2}}{2 - \frac{\frac{1}{2}}{1 - \frac{1}{2}}}}$$

2. Find the value of  $2.4607 \times .06 - 3.75 \times .012 + 2.163 \div 1.03$ .
3. Find the value of 15 cwt. 3 qr. 9 lb. at R25. 12s. 7d. per cwt.
4. If a man walking at the rate of  $3\frac{1}{2}$  miles an hour, walks to a place in 4 hours 30 minutes, how long will it take a man, walking at the rate of  $2\frac{1}{4}$  miles an hour, to walk there and back?

5. A man invests a certain sum in  $4\frac{1}{2}$  per cent. Government Papers at 104. The price falling to 101, he sells out and loses Rs 600 by the transaction, exclusive of brokerage. Find the sum invested.

6. A gives B 10 yards' start and C 15 yard's start in a race of 100 yards; how much should B give C in 150 yards?

## 1892.

1. Simplify  $\frac{2\frac{5}{6} - 1\frac{7}{8} \text{ of } \frac{3\frac{4}{5}}{11\frac{3}{4} \text{ of } \frac{9}{10} \text{ of } \frac{2}{3}}}{\frac{4\frac{1}{2} - 7\frac{5}{6} + 3\frac{2}{3}}{6 \text{ of } 12}}$ .

2. Find, to the nearest integer, the value of  $\frac{39.37 \times 760 \times 13.596}{1.293 \times 12}$ .

3. Find the square roots of .097344, of .009604, and of .996004.

4. Find the interest on 10 lakhs of rupees for 10 days at  $4\frac{1}{2}$  per cent. per annum.

5. £3,000, which I held in the Four per cents., was sold for me when they were at  $82\frac{1}{2}$  by a broker whose commission is  $\frac{1}{2}$  per cent.; and the proceeds were re-invested by him in the Four and a half per cents. at  $98\frac{1}{2}$ . What amount of the latter stock did he purchase?

## 1893.

1. Simplify —

(1)  $1 + \frac{1}{2} + \frac{2}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \frac{1}{7}$ ;

(2)  $\frac{8\frac{1}{4} - 1\frac{1}{4}}{\frac{8}{4} + 1\frac{1}{4}} - \frac{1}{5\frac{1}{4} - 1\frac{1}{4}}$ .

2. Divide 1.84626 by 23.4.

Express  $4\frac{5}{6}$  and  $6\frac{5}{4}$  as vulgar fractions reduced to their lowest terms, and their sum as a circulating decimal.

3. Find the cost of 73 cwt. 3 qr. 14 lb at £4 13s 6d. per cwt.

4. Distinguish between true discount and banker's discount.

Find the former in the case of a bill for Rs 3486. 6a 8p due 16 months hence, the rate of interest being  $5\frac{1}{2}$  per cent. per annum.

5. A man invests Rs 163000, part in Government 4 per cent. stock at 108, and the remainder in Municipal 5 per cent. debenture stock at 109. Find how much he must invest in each in order that he may have an equal income from the two sources.

## 1894.

1. In a compound metal containing tin and copper only, the proportion of tin to copper is 7.75 to 92.25. Find to the nearest penny the value of 8 cwt. 3 qr. of it. Tin costs 140/-; copper 80/- per ton.

2. A rectangular court is 50 yards long and 30 yards broad. It has paths joining the middle points of the opposite sides of 6 feet in breadth and also paths of the same breadth running all round it. The remainder is

covered with grass. If the cost of the pavement be 1s. 8d. per square foot and the turf 3s. per square yard, find the cost of laying out the court.

3. Find the value of  $267\frac{1}{875}$  of £3 in shillings, pence, and decimal of a penny.

4. Find the square root of  $1 - (0.678)^2$  to four places of decimals.

5. At a cricket match, a contractor provided luncheon for 24, and fixed the price to gain  $12\frac{1}{2}$  per cent. on his outlay. Three persons were absent. The remaining 21 paid the fixed price, and the contractor lost 2 rupees. What was the charge?

### 1895.

1. Find the square root of  $1 + \frac{1}{2} (0.345)^2$  correctly to four places of decimals.

2. Find the sum of money which put out at simple interest at  $2\frac{5}{8}$  per cent. per annum will in 134 days exactly produce R124. 10s.  $1\frac{247}{360}$ p. (A year contains 365 days.)

3. If one pound sterling be worth twenty-five francs and sixty centimes; and also worth six thalers and twenty silver groschen; how many francs and centimes is one thaler worth?

[*N. B.* One thaler = 30 silver groschen.

One franc = 100 centimes.]

4. Simplify

$$\frac{1\frac{1}{2} - \frac{5}{12}}{1\frac{1}{2} + \frac{5}{12}} + \frac{1}{5} \text{ of } \frac{9 \times 5}{14 \times 3} - \frac{11\frac{1}{2}}{15}.$$

5. I invest R12805 in the four per cents. at  $98\frac{1}{4}$ , and when they have risen to  $102\frac{1}{2}$  I sell out and invest in the  $4\frac{1}{2}$  per cents. at  $105\frac{1}{2}$ ; what is the change in my income? (Brokerage  $\frac{1}{2}$  per cent. on all transactions.)

Or convert  $1\frac{8}{9}\frac{1}{2}$  into a decimal fraction, pointing out accurately the recurring portion (if any).

### 1896.

1. What greatest number and what least number can be subtracted from 23759143 that the remainders may be divisible by 24, 35, 91, 130, and 150?

2. (1) Simplify

$$\frac{5\frac{5}{8}}{6\frac{1}{2}} \text{ of } \frac{6\frac{7}{8}}{9\frac{1}{2}} \div \frac{5}{8} (2\frac{5}{12} + \frac{1}{2}) \text{ of } \frac{7s. 6d.}{12s. 6d.}$$

(2) Divide 0023465 by 03125.

3. Extract the square root of  $5\frac{1}{4}$  correct to 4 places of decimals.

4. Find the simple interest on R4235. 12s. 9 $\frac{1}{2}$ p. for 3 years and 7 months at  $3\frac{1}{2}$  per cent. per annum.

5. If by selling a horse for R1100, I lose 18 per cent.; how much per cent. should I have gained or lost, had it been sold for R1320?

6. A man invested the same sum in two different stocks,  $3\frac{1}{2}$  per cent. Government Securities at  $103\frac{1}{2}$  and 4 per cent. Municipal Debentures at  $105$ ; his income from one is Rs 93 more than from the other; what sum was invested in each stock?

1897.

1. Reduce

$$\frac{2\frac{1}{2} - 1\frac{1}{2}}{2\frac{1}{2} + 1\frac{1}{2}} \times 154\frac{1}{2} \div \frac{3\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} - 1}{3\frac{1}{2} \times 3\frac{1}{2} \times 3\frac{1}{2} + 1} \text{ of } 1 \text{ cwt. } 3 \text{ qr. } 7 \text{ lb. to the decimal of } 2\frac{1}{2} \text{ tons.}$$

(a) Find the vulgar fraction equivalent to the recurring decimal  $1\overline{33}$ , without assuming any rule.

2. What do you understand by an *aliquot* part of a quantity? Is an area equal to  $15\frac{1}{4}$  sq. yd. an aliquot part of an acre?

Find, by Practice, the income-tax on Rs 1250. 10a. 8p. at the rate of 5 pices per Rs.

3. What is meant by the *ratio* of one quantity to another? What is a *proportion*?

320 people dine together 4 days a week, but on the remaining 3 days some are absent; the consumption of food is thus reduced, for the whole week, in the ratio of 109 to 112. Find the number of absentees.

4. In what time will Rs 3546 amount to Rs 7683 at  $3\frac{1}{2}$  per cent. simple interest?

5. A person has stock in the  $3\frac{1}{2}$  per cent. Government Securities, which yields Rs 2856 a year. He sells out half of the stock at  $109\frac{1}{2}$ , and invests the proceeds in Howrah Mills shares at  $153$ . What dividend ought the latter to pay that he may thereby increase his annual income by Rs 330?

6. Extract the square root of  $3\overline{14159}$  to 4 decimal places.

1898.

1. What is that least number which being divided by 48, 64, 72, 80, 120 and 140 leaves the remainders 38, 54, 62, 70, 110 and 130 respectively?

2. (a) Simplify  $\frac{2\frac{1}{2}}{5\frac{1}{2}}$  of  $\frac{8}{5} (5 + 1\frac{1}{2}) \div \frac{5\frac{1}{2}}{7\frac{1}{2}}$  of  $\frac{2s. 5d.}{3s. 11d.}$ .

(b) What decimal of £2 13s. 4d. is  $0\overline{625}$  of  $2\frac{1}{6}$  of £1. 6s. 8d.?

3. Extract the square root of 54756, also of  $(4.02)^2$  to 4 places of decimals.

4. What sum will amount to Rs 300 in  $3\frac{1}{2}$  years at  $6\frac{1}{4}$  per cent. per annum simple interest?

5. A grocer buys 480 mds of sugar for Rs 135 payable at the end of 3 months, and on the same day sells them at Rs 12, 11a. per maund ready money. What per cent. does he gain or lose by the transaction, reckoning interest at 9 per cent. per annum?

6. One-third of a certain capital is invested in the  $3\frac{1}{2}$  per cent. Government Securities at 105, one-fourth in the 3 per cent. Government Securities at  $97\frac{1}{2}$ , and the remainder in the  $4\frac{1}{2}$  per cent. Calcutta Municipal Debentures at  $112\frac{1}{2}$ . If the total annual income is Rs 30, what is the capital?

## 1899.

1. Find the greatest number which will divide 1028, 1629 and 2130 leaving the remainders 3, 4 and 5 respectively.

2. (a) Simplify  $\frac{\frac{2}{3} + \frac{1}{4}}{\frac{3}{5} + \frac{1}{4}}$  of  $\frac{13\frac{1}{2}}{9\frac{1}{2}} \text{ ton} \div \frac{2}{3}(\frac{2}{3} + \frac{1}{4})$  of  $\frac{3}{4} \text{ tons } 3 \text{ cwt.}$

(b) Prove that  $2\frac{3}{4} = \frac{33}{16}$  without assuming the rule of converting a recurring decimal into a vulgar fraction.

3. Find, by Practice, or otherwise, the value of 7 tons 2 cwt. 2 qrs. at Rs. 2a. per maund, assuming that 1 ton is equal to  $27\frac{1}{2}$  maunds.

4. Extract the square root of 51076 and of .051076.

5. A grocer mixed 20 maunds of one kind of rice at Rs 4 a maund with a certain quantity of a second kind of rice at Rs 3  $\frac{8}{9}$  a maund, and selling the mixed rice at Rs 3. 12a. a maund, gained Rs 10. Find how much rice he mixed, and the gain per cent. on his outlay.

6. Find the discount on Rs 1218 due six months hence at 3 per cent. per annum simple interest.

## 1900.

1. What do you understand by the Greatest Common Measure and the Least Common Multiple of two or more whole numbers? Nine bells begin to strike simultaneously and strike at intervals of 1, 2, 3, 4, 5, 6, 7, 8, 9 seconds respectively. After what interval of time will they next strike simultaneously?

2. (a) Simplify  $\frac{16\frac{1}{2} - 3\frac{1}{2}}{\frac{2}{7}} \text{ of } 2\frac{1}{2} \times \frac{2\frac{5}{7} \text{ of } 4\frac{2}{3} + \frac{1}{2} \text{ of } 13\frac{1}{2}}{5\frac{1}{2} - 4\frac{1}{2}} \text{ of } \frac{67}{6} \div 1\frac{1}{2}$ .

(b) Reduce .0416 to its equivalent vulgar fraction in its lowest terms, and explain the reason for the process you employ.

3. Find the value of  $(1.25)^3 + 2.25 \times (1.25)^2 + 3.75 \times (1.75)^2 + (1.75)^3$ , without reducing the decimals to vulgar fractions

4. The length, the breadth and the height of a room are 25 ft. 7 ins., 20 ft. 5 ins. and 14 ft. respectively. Its walls are papered at 3s. 6d. a sq. yd. and its ceiling painted at 1s. 2d. a sq. ft. Find the total cost.

5. The subscriptions to a certain memorial fund amount to Rs 976 9a. and each person subscribed as many annas as there were subscribers altogether. Find the number of subscribers.

6. Explain clearly what you mean by saying that the  $3\frac{1}{2}$  per cent. Government Securities are at 101.

A person invests Rs 19,700 in the  $3\frac{1}{2}$  per cent. Government Securities at  $98\frac{1}{2}$ , and when they rise to  $101\frac{1}{2}$  he sells out and invests the proceeds in the  $4\frac{1}{2}$  per cent. Calcutta Municipal Debentures at  $114\frac{1}{2}$ . Find the change in his income.

## 1901.

1. (a) Simplify  $\frac{306}{323} \div \frac{204}{221}$  of  $\frac{22\frac{5}{11}}{23\frac{9}{11}} - 58\frac{2}{3} \times 14285\frac{7}{9}$ , expressing your answer as a decimal.

(b) Reduce £3. 15s. 4d. to the decimal of Rs 100. [£1 = Rs 15.]

2. (a) What is meant by an *aliquot part* of a number?

Is  $2\frac{2}{3}$  yds. an aliquot part of a mile?

(b) Find, by Practice, or otherwise, the value of 25 tons 15 cwt. 3 qrs.  $17\frac{1}{2}$  lb. at £2. 13s. 4d. per ton.

3. If the fourpenny loaf weighs 3 lb. 9 oz. when wheat is at 9s. 4d. per bushel, what ought the sixpenny loaf to weigh when wheat is at 11s. 1d. per bushel?

4. (a) Define *Interest*. What do you understand by the expression *Rate per cent. per annum*?

(b) At what rate per cent. per annum simple interest will £200 amount to £236. 13s. 4d. in 4 years 7 months?

5. Extract the square root of 74684164.

6. A man invests one-third of his capital in the  $3\frac{1}{2}$  per cent. Government Securities at 95 $\frac{1}{2}$ , and the remaining two thirds in the  $4\frac{1}{2}$  per cent. Calcutta Municipal Debentures at 105 $\frac{1}{2}$ . If the difference of the two annual incomes be Rs 997, find his capital.

## 1902.

1. How can you ascertain whether a given vulgar fraction can be reduced to a terminating or a recurring decimal without actually converting it into a decimal? What kind of decimal will the fraction  $\frac{1481}{17518}$  produce?

(b) Simplify

$$1 - \frac{2}{4} \div 2 \text{ 08}\frac{2}{3} \text{ of } \frac{2 \text{ cwt. 2 qrs. 21 lb.}}{10 \text{ cwt. 2 qrs. 11 lb.}}$$

$$3 + \frac{6}{5 - \frac{6}{7 + \frac{6}{5}}}$$

and reduce the result to the decimal of 1.1.

2. The area of a rectangular field whose breadth is 500 yards is 100 acres. Find the cost of cultivating it at Rs 3. 2a. 8s. per 100 square yards and also the cost of fencing it round at Rs 2. 8s. per yard.

3. If 12 men and 15 boys can do a piece of work in 30 days working  $7\frac{1}{2}$  hours a day, how many boys must assist 21 men to do a piece of work twice as great in 25 days, working 9 hours a day? (3 men = 5 boys.)

4. Extract the square roots of  $5\frac{1}{18}$  and  $76.195441$ .

5. (a) Define *discount*.

(b) Find the discount on £700 due 3 years 4 months hence at 5 per cent. per annum simple interest.

6. Which is the better investment, the  $3\frac{1}{4}$  per cent. Government Securities at  $95\frac{3}{4}$ , or the 4 per cent. Calcutta Municipal Debentures at  $101\frac{1}{2}$ ? What will be the difference in the annual income by investing  $\text{Rs}2,127$  in each of them?

## 1903.

1. (a) Simplify:—

$$\frac{.67 \times .67 \times .67 - .001}{.67 \times .67 + .067 + .01} + \frac{.57}{1 + \frac{1}{1 + \frac{1}{3 \frac{1}{14}}}}$$

(b) What decimal of a mile is a yard?

2. (a) What is meant by the aliquot part of a number? Is an acre an aliquot part of a square mile?

(b) Find, by Practice, or otherwise, the price of 25 tons 12 cwt. 3 qrs.  $17\frac{1}{2}$  lb. at  $6\text{l. }13\text{s. }4\text{d.}$  per ton.

3. Three taps *A*, *B* and *C* can fill a cistern in 5, 6 and  $7\frac{1}{2}$  minutes respectively. They are all turned on at once; but after one minute, *A* is turned off. How much longer will *B* and *C* take to fill the cistern?

4. (a) Define the square root of a number.

(b) Extract the square root of  $10\frac{3}{4}$ , and of  $2\frac{2}{7}$  to four places of decimals.

5. A man buys wine at 5s. a gallon; he mixes it with water, and by selling the mixture at 4s. a gallon gains  $12\frac{1}{2}$  per cent. on his outlay. How much water did each gallon of the mixture contain?

6. (a) Define Present Worth.

(b) A tradesman marks his goods with two prices, one for ready money and the other for 3 months' credit, allowing interest at  $4\frac{1}{2}$  per cent. per annum. If the credit price be marked at  $\text{Rs}50. 9\text{a.}$ , what ought to be the cash price?

## 1904.

1. Define the G. C. M. and the L. C. M. of two or more numbers.

(a) Find the greatest number of six digits which is exactly divisible by 27, 45, 72 and 96.

2. Write down the local value of each of the figures in the number 010203.

(a) Simplify  $\frac{(.01)^3 + (.02)^3 + (.03)^3}{(.001 + .002 + .003)^2} - .0208\frac{3}{4} \div \frac{.22}{.25} 3\text{s. }4\text{d.}$  of  $\frac{1}{2}$ .

3. *A* can do a piece of work in 25 days, *B* in 20 days, and *C* in 24 days. The three work together for 2 days, and then *A* and *B* leave; but *C* continues, and after  $8\frac{1}{3}$  days is rejoined by *A*, who brings *D* along with him, and these three finish the remainder of the work in 3 days. In what time would *D* alone have done the whole work?

4. The area of a square cricket field is 9 ac. 3 ro. 8 $\frac{1}{16}$  po. ; find the length of a side.

5. Define *Discount*.

(a) The difference between the interest and the discount on a certain sum for 3 years 4 months at 5 per cent. per annum is £16. 13s. 4d. Find the sum.

6. A person invests a certain sum in the 3 $\frac{1}{2}$  per cent. Government Securities when they are at 97 $\frac{1}{2}$ . had he waited till they had fallen to 97 $\frac{1}{2}$ , he would have had Rs. 400 more of Government Securities. How much money did he invest,  $\frac{1}{2}$  per cent. being charged as brokerage in both cases ?

1905.

1. When is one number said to be a *measure* of another ? What is a *Prime Number* ?

A man bought two heaps of mangoes, one for R10. 5a. and the other for R18. 0a. 9 $\frac{1}{2}$ . If the price of each mango be the same, and not less than two and not more than three annas, find the total number of mangoes he bought.

2. (1) What is the meaning of  $\frac{2}{3}$  and of  $\frac{1}{2}$  of  $\frac{2}{3}$  ?

(2) Simplify :—

$$(5\frac{1}{2} - 2\frac{5}{12}) \text{ of } \left( \frac{\frac{2}{3}}{3\frac{1}{2}} \div \frac{1}{2} \text{ of } \frac{2}{3} \right) - \frac{5}{12} \text{ of } \frac{3 \text{ tons } 3 \text{ cwt.}}{9 \text{ cwt.}}$$

3. Extract the square root of 19.951 and of  $\frac{5}{3}$  correct to three places of decimals.

4. Find the cost of paving a pathway 6 ft. wide, round and immediately outside a flower garden, 21 yds. long and 10 yds. broad, at 5 $\frac{1}{2}$  pies per sq. yd.

5. Find the price of 35 mds. 13 $\frac{3}{4}$  srs of rice at R3. 2a. per maund.

If it is sold at the rate of R3. 3 $\frac{1}{4}$ a. per maund, what is the profit per cent ?

6. I pay R45900 to a Bank for a Bill of Exchange payable in London. The rate of exchange is 1s. 4d. for the rupee and the Bank charges me 2 per cent. on the amount payable in England. How much will my agent in London receive ?

1906.

1. (1) When is one number said to be a *multiple* of another ? How can you ascertain by inspection whether a given number is a multiple of 3 ?

(2) What is the greatest number consisting of five digits which can be added to 8321 so that the sum may be exactly divisible by 15, 20, 24, 27, 32 and 36 ?

2. (1) What is the meaning of  $\frac{2}{3}$  of  $\frac{1}{2}$  ? Give an illustration.

(2) Simplify :—

$$(a) 12 \times \left( \frac{3}{5} - \frac{1}{4} - \frac{1}{3} - \frac{1}{7} - \frac{1}{13} \right) \div \frac{823}{361} \div \frac{25}{27} \text{ of } \frac{11s. 4d.}{12s. 3d.}$$

$$(b) \frac{1.59 \times 15.9 - 41 \times 4.1}{15.9 - 4.1}.$$

3. The cost of matting a room 16 ft. broad and 12 ft. high at 3a. per sq. yd. is Rs 7 9a 4d. What will be the cost of papering its walls at the same rate, allowing for six doors, each 6 ft. by 3 ft. ?

4. Extract the square root of '027 and of  $\frac{2}{5}$  correct to four places of decimals.

5. A book sent from England costs me (including Rs. 1. 2a. postage) Rs 12. 1a. But my bookseller allows me a discount of 2d. in the shilling on the published price. What is the published price in English money, the rate of exchange being 1s. 4d. for the rupee ?

6. Define *Present Worth*.

A man bought a horse for 30'guines and sold him immediately for £36. 1s. payable at the end of 6 months. If interest be reckoned at 6 per cent. per annum, find his gain per cent. upon the transaction.

### 1907.

1. What do you understand by the G. C. M. and the L. C. M. of two or more integers ? What is a prime number ? Find the least number which is exactly divisible by 12, 34, 56 and 78.

2. Simplify :—

$$(1) \frac{2 \times '2 \times 2 + '02 \times '02 \times '02}{6 \times 6 \times 6 + '06 \times '06 \times '06} \div \frac{2\frac{1}{3} - 1.16}{2\frac{2}{3} + 1\frac{1}{3}}.$$

$$(2) \frac{2 \ 5a \ 6d}{Rs \ 3. 12a} - \frac{1 \ hr. 16 \ m. 45 \ sec.}{2 \ hr. 7 \ m. 45 \ sec.}$$

3. Find the price of 8 mds. 16 srs. 2 chks. of rice at Rs 5. 9a. per maund.

4. How many paving stones, each of them 1 foot long and 9 in. wide, will be required for paving a street 30 ft. wide, surrounding the outside of a square grass plot, the area of the grass plot being 10 acres ?

5. If 8 men or 15 women can earn Rs 20 in 30 days, how much can 21 men and 24 women earn in 45 days ?

6. The debts of a bankrupt amount to £2134. 10s. 6d. and his assets consist of property worth £916. 5s. 4d. and an undischarged Bill of £513 due 4 months hence, simple interest at 4 per cent. How much in the pound can he pay to his creditors.

### 1908.

1. (1) When can a vulgar fraction be converted into a terminating decimal ? What kind of decimal will the fraction  $\frac{11}{18}$  produce ?

(2) Simplify :—

$$\frac{2\frac{1}{4} + \frac{3}{4} \text{ of } 2\frac{3}{4} - 1\frac{1}{4}}{3\cdot6 + 1\frac{1}{2} \times 4 \div 24 - 2\cdot1} \text{ of } \frac{20 \text{ I of 1 md. } 30\frac{1}{2} \text{ sr.}}{17 \frac{5625}{10000} \text{ of 2 md. } 20\frac{1}{2} \text{ sr.}} \text{ of Rs. 2. 8a.}$$

2. Find, by Practice, or otherwise, the value of 5 acres 3 roods 7 poles  $5\frac{1}{2}$  sq. yds of land at Rs. 161. 6s. 8d. per acre.

3. (a) The hands of a clock coincide after every 66 minutes of correct time. How much is the clock fast or slow in 24 hours?

(b) A race course is 440 yds long. *A* and *B* run a race and *A* wins by 5 yds; *B* and *C* run over the same course and *B* wins by 4 yds; *C* and *D* run over it and *D* wins by 16 yds. If *A* and *D* run over it which would win and by how much?

4. (a) What number multiplied by itself will produce  $4\frac{15}{27}$ ?

(b) Extract the square root of  $\frac{2}{7}$  correct to four places of decimals.

5. A trader allows a discount of 5 per cent to his customers. What price should he mark on an article the cost price of which is Rs. 12. 8a., so as to make a clear profit of  $33\frac{1}{3}$  p. c. on his outlay?

6. A person invests rupees 44100 in the  $3\frac{1}{2}$  p. c. Government Securities at 98 and when they rise to  $98\frac{1}{2}$  he sells out and invests the proceeds in the 5 p. c. Calcutta Municipal Debentures at  $110\frac{1}{2}$ . Find the alteration in his income.

#### ALTERNATIVE QUESTIONS.

2. A reservoir is 25 ft. 5 in. long and 12 ft 10 in. wide. How many gallons of water must be drawn off to make the surface sink 1 ft.? (A cubic foot of water weighs 1000 ounces and 1 gallon = 10 lb. avoirdupois).

4. The discount on a certain sum due 2 years hence is Rs. 38. 8a. and the interest on the same sum for the same time is Rs. 18 5a. Find the sum and the rate per cent. per annum

1909.

1. Multiply 62031 by 46189, and divide the product by 7429.

2. Simplify :—

$$(1) \frac{10\frac{1}{2} - (5\frac{1}{2} + 4\frac{3}{4})}{10\frac{1}{2} - (2\frac{1}{2} - \frac{1}{4}) - 7} - \frac{1}{6 + \frac{1}{1 + \frac{1}{2}}}.$$

$$(2) 2\cdot142857\bar{1} - 0\cdot0769230\bar{7} \times 2\frac{1}{2}$$

3. Find, by Practice, the price of 28 bags of sugar, each weighing 3 cwt. 2 qrs. 1 lb., at Rs. 9 6s. 4d. per cwt

Or,

Extract the square root of 137769 395929.

4. The area of a square garden is 10 acres. On the inside of the garden and along four sides of it there is a gravel path 5 feet wide. Find the cost of constructing the path at 1 anna 6 pies per square foot.

*Or,*

On what capital will the interest for 219 days at 4 per cent. per annum amount to £14. 2s. 6d. ?

5. Among a certain number of children 91509 mangoes and also 83721 oranges may be equally divided. How many are the children ? Give all possible answers.

*Or,*

What profit per cent. is made by selling an article at a certain price, if by selling at two-thirds of that price there would be a loss of 20 per cent.

UNIVERSITY OF CALCUTTA. MATRICULATION PAPERS.

1910

COMPULSORY PAPER.

1. Multiply 407566 by 800209 ;  
and divide 507233438305 by 670549.

*Or,*

Find the G. C. M. of 253512 and 568512 ;  
and the L. C. M. of 432, 720, 1152.

2. Reduce to its simplest form —

$$(1) \frac{4\frac{1}{2} \times 17\frac{1}{7} \times 2\frac{1}{3}}{5\frac{1}{3} \times 5\frac{1}{7} \times \left( \frac{4}{4\frac{1}{2}} \times \frac{1}{6\frac{1}{3}} \right)} ;$$

$$(2) \frac{.81 \times .005}{.45} .$$

*Or,*

A contractor engaged to finish six miles of railway in 200 days, but after employing 140 men for 60 days he found that only one and a half miles were completed. How many additional men must be engaged that the work may be finished within the given time ?

3. (1) Find, by Practice or otherwise, the value of 458 things at Rs. 8. 5 as. 4 pies each.

(2) In what time will a sum of money double itself at 6 per cent. simple interest per annum ?

*Or,*

The weight of a cubic inch of water is 253.17 grains and that of a cubic inch of air is .31 grains. Find to three places of decimals how many cubic inches of water weigh as much as one cubic foot of air.

## ADDITIONAL PAPER.

1. Extract the square root of 6256586734489.

Or,

A cistern contains  $243\frac{1}{8}$  cubic feet of water. Find the length of the side of a second cistern 4 ft. 4 in. deep, with a square base, which contains 4 times as much water as the first.

2. (1) Calculate, correct to three places of decimals, the value of

$$1 + \frac{1}{1.2} + \frac{1}{1.2.3} + \frac{1}{1.2.3.4} + \text{&c. to infinity.}$$

(2) A metre is defined to be the ten-millionth part of a quarter of the circumference of the earth, and is equal to 39.37079 inches. Find the circumference of the earth in miles.

## 1811.

## COMPULSORY PAPER.

1. Multiply 87904563 by 7059089 ;  
and divide the product by 998875.

Or,

A square grass-plot whose side is 200 yards, is bordered on the outside by a path 10 feet wide. Find the cost of graveling the path at Rs. 2. 8 as. per 100 square feet.

2. (1) Simplify :—

$$\frac{\frac{1}{2} + \frac{1}{2}}{\frac{1}{2} - \frac{1}{2} + \frac{1}{16}} = \frac{1}{16} \text{ of } 10 \frac{20}{103}.$$

(2) What decimal of a rupee is a pie ?

Or,

What decimal of an hour is a second ?

3. (1) Find the value of 5 mds 25 seers 10 chts. of milk at Rs. 5.  
10 as. 8 p. per maund.

(2) What sum of money must be put out at  $3\frac{1}{2}$  per cent. per annum, simple interest, in order to amount to £248. 18s. 9d. in  $2\frac{1}{2}$  years ?

Or,

A contractor undertakes to execute a certain work in a given time ; he employs 55 men, who work 9 hours daily ; when  $\frac{2}{3}$  of the time has expired, he finds that only  $\frac{2}{5}$  of the work is done ; how many men must he now employ 11 hours a day to fulfil his contract ?

## ADDITIONAL PAPER.

1. Find the square root of

220191808516,

Or,

2619 46783041.

Or,

A general wishing to arrange his men, who were 335250 in number, into a solid square, found that there were 9 men over. How many men were there in the front?

2. (1) Find a decimal that is within  $\frac{1}{100000}$  of  $\frac{355}{113}$ .

Or,

Find the value (correct to five places of decimals) of

$$1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} - \dots$$

(2) Assuming a metre to be  $39\frac{5}{8}$  inches, find the nearest whole number of litres in one cubic foot.

1912.

## COMPULSORY PAPER.

Multiply 814703 by 703692 ;  
and divide 246741768 by 75318

Or,

Reduce to its lowest terms

$$\frac{142593}{514199}$$

2. (1) Reduce to the Simplest Vulgar Fraction

$$\frac{2\cdot4\dot{6} - 2\cdot\dot{3}\dot{0}}{3 + 1\cdot2\dot{7}} + \frac{4\frac{1}{8}}{19}$$

(2) Find the value of

$$\frac{3 \text{ cwt. } 3 \text{ qrs. } 14 \text{ lb.}}{2 \text{ cwt. } 1 \text{ qr. } 20 \text{ lb.}} \text{ of } £7. 18s. 8d.$$

Or,

(1) At what rate per cent. simple interest will £440. 6s. 8d. amount to £511. 17s. 9d. in 5 years?(2) Find the price of 12 maunds 8 seers 4 chhataks of Ghee at Rs. 36. 4as. per maund3. If the wages of 45 women amount to £207 in 48 days, how many men must work 16 days to receive £76. 13s. 4d., the daily wages of a man being double those of a woman?

*Or,*

A rectangular Court-yard 100 feet long by 80 feet wide has within it a gravel path 8 feet wide running round it. Find the area of the path, and the cost of graveling it at 5a. 3d. per square yard.

ADDITIONAL PAPER.

1. Find the square root of

$$137769 \cdot 395929.$$

A rectangular Court, three times as long as it is broad, is paved with 2028 stones, each  $1\frac{1}{4}$  feet square. Find the length of the Court.

2. If a metre be 3 2809 feet and the length of a line drawn on the earth from the North Pole to the Equator be 10,000,000 metres, find the circumference of the earth to the nearest mile.

*Or,*

Find, correct to five places of decimals, the value of

$$\frac{1}{2} + \frac{1}{3} \cdot \frac{1}{2^3} + \frac{1}{5} \cdot \frac{1}{2^5} + \frac{1}{7} \cdot \frac{1}{2^7} + \frac{1}{9} \cdot \frac{1}{2^9} + \dots$$

1913.

COMPULSORY PAPER.

1. (1) Multiply 426042 by 90578.

*Or,*

Divide 5208465 by 754.

(2) Find the G. C. M. of 253512 and 568512.

*Or,*

Find the L. C. M. of 105, 135 and 210.

2. (1) Simplify  $\frac{1}{2} + \frac{3}{4} - \frac{5}{6} + \frac{7}{8} - \frac{9}{10} - \frac{11}{12}$

(2) Express in decimals the sum of

$$'438 \times '15 \text{ and } \frac{063}{28}.$$

*Or,*

(1) Find what decimal of a maund is a chhatak.

(2) Find the price of 432 pieces of cloth at Rs 5. 7as. 6d. each.

3. (1) If Rs. 750 amount to Rs. 873 12as. in 5 years and 6 months, find the simple interest per cent. per annum.

(2) A can run 8 yards in the same time that B can run 9. They start together; when B has run 252 yards, how far behind is A?

## ADDITIONAL PAPER.

1. Find the square root of 29.192409.

Or,

Find the cost of fencing a square field of 10 acres at 6 as. 8 pies per yard.

2. A room is 20 metres in length and 10 metres in breadth. Find the number of square yards in the area of the floor, taking a metre as equal to 39.37 inches.

Or,

Define a prime number, and state all the prime numbers between 70 and 90.

1914.

## COMPULSORY PAPER.

1. Multiply  $777\frac{5}{8}\frac{7}{5}$  by 358, and express the result as a whole number, and a proper fraction.

2. Find the G. C. M. of 7163 and 13091.

Or,

Find the L. C. M. of 48, 72, 80, 108, and 120.

3. Simplify  $\frac{3\frac{5}{8} + 1\frac{7}{9} + 9\frac{1}{16}}{11\frac{7}{15} - 5\frac{1}{8}} \div \frac{16\frac{2}{5}}{16\frac{8}{9} - 2\frac{1}{16}}$ .

Or,

Find the Price of 273 maunds, 33 seers, 7 chhataks of Ghee at Rs. 53. 8as. per maund.

4. Add together 0.022 of £1,0.946 of a shilling, and 3.48 pence, and subtract the sum from 0.26 of a guinea. Express the answer in pence and the decimal of a penny.

Or,

Find what sum will amount to Rs. 723. 0as. 10p. in 6 years and 3 months at  $4\frac{1}{2}$  per cent. per annum, Simple interest.

## ADDITIONAL PAPER.

1. Extract the square root of 7 correct to 3 places of decimals.

Or,

Show that 103 is a prime number.

2. Given one centimetre = 0.3937 inches, find in square metres the area of a floor whose length is 21 feet and breadth 10 feet 8 inches.

1915.

## COMPULSORY PAPER.

1. (1) Multiply 790463 by 95076.

Or,

Divide 277286112 by 35064.

(2) Find the G. C. M. of 253512 and 568512.

Or,

Find the L. C. M. of 125, 160, and 280.

2. (1) Simplify  $2 - \frac{5}{3 + \frac{1}{2 - \frac{1}{1 + \frac{1}{2}}}}$ .(2) Multiply 17.55 by 4004, and divide the product by 0.819.  
(The results are to be expressed in decimals.)

Or,

(1) Express as a recurring decimal

$$0.4 + \frac{1.5}{0.13}$$

(2) Find the price of 729 slabs of marble at Rs. 11a. 3d. each.3. (1) At what rate per cent per annum (simple interest) will a sum of money double itself in 10 years?(2) Find the cost of papering the walls of a room 12 ft. 6 in. long, 7 ft. 6 in. wide, and 12 ft. high, with half-anna postage stamps measuring  $\frac{1}{16}$  inch by  $\frac{1}{8}$  inch.

## ADDITIONAL PAPER.

1. Find the square root of 170 485249.2. The palace of the King of Babylon contained a thousand rectangular court-yards, each 60 metres long and 54 metres broad. The court-yards were all paved with marble slabs, 18 inches long by 18 inches broad. Required the total number of slabs (Metre = 39.37 inches.)

Or,

Multiply 0.48785 by 0.85963 by a contracted method so as to obtain the result correct to five places of decimals.

1916.

## COMPULSORY PAPER.

1. (1) Multiply 560789 by 987065.

Or,

Divide 823479885 by 9897.

(2) Find the G. C. M. of 36176 and 85085.

Or,

Find the least whole number which is exactly divisible by 1, 2, 3, 4, 5, 6, 7, 8 and 9.

2. (1) Simplify

$$\frac{\frac{3}{2}}{2\frac{1}{4}} \div \frac{2\frac{1}{2} \div 7}{\frac{8}{3}} + \frac{85}{204}.$$

(2) What decimal of a sovereign is a penny?

Or,

(1) Express  $\frac{225}{9999}$  as a terminating decimal fraction.

(2) Find the cost of 153 articles at £1. 2s. 8d. each.

3. (1) If I have to pay 2 pies as interest on one rupee for one month; what is the rate per cent. per annum?

(2) If 24 men can do a piece of work in 15 days, working  $8\frac{1}{2}$  hours a day, how many men will be required to do another piece of work twice as great in 17 days, working 6 hours a day?

#### ADDITIONAL PAPER.

1. Find the square root of 0 0041409225.

2. Express the value of

$0.04375$  kilogram +  $0.3775$  gram +  $0.72$  milligram as the decimal of a pound Avoirdupois.

[1 gram = 15 432 grains, and one pound Avoirdupois = 7000 grains.]

Or,

Divide  $2.4494897$  by  $1.4142135$  by a *contracted method*, correct to three decimal places.

1917.

#### COMPULSORY PAPER.

1. (a) Multiply 783256 by 347816.

Or,

The quotient after division of a certain number by 372 is 273 and the remainder is 237. Find the number.

(b) Find the G. C. M. of 31752 and 41580.

Or,

The circumferences of the fore-wheel and hind-wheel of a carriage are 9 ft. 11 in. and 12 ft. 9 in. respectively. Find the least distance over which the carriage must travel in order that both the wheels may make a complete number of revolutions.

2. (a) Simplify  $\frac{\frac{5}{3} + \frac{3}{4}}{\frac{1}{3} + \frac{2}{3}} + \frac{x}{3x^2}$ .

*Or,*

Find the value of  $\frac{1}{5}$  of 9s. 10d. -  $\frac{1}{4}$  of 6s. 9d. +  $\frac{1}{3}$  of £1. os. 7d.

(Express the answer in shillings and pence.)

(b) Simplify  $\frac{1701 - 16 \cdot 2}{005 \times 07}$ .

*Or,*

Reduce  $\frac{7}{17}$  to recurring decimals.

3. (a) Find the cost of 21 tons 5 cwt. 3 qrs. of coal at Rs. 5 per ton.

*Or,*

Find the simple interest on Rs. 892 for 8 months at  $6\frac{1}{4}$  per cent. per annum.

(b) By selling goods at Rs. 240 a merchant gains 25 per cent. How much would he gain per cent. by selling them at Rs. 216?

*Or,*

In an examination 52 per cent. of the candidates fail in English and 42 per cent. fail in Mathematics. If 17 per cent. fail both in English and Mathematics, find the percentage of those who pass in both subjects.

#### ADDITIONAL PAPER.

1. Find the square root of 57592921.

*Or,*

Find to within one millimetre the length of the side of a square whose area is two square metres.

2. Calculate, to four places of decimals, the value of

$$1 + \frac{1}{2} + \frac{1}{2 \times 4} + \frac{1}{2 \times 4 \times 6} + \frac{1}{2 \times 4 \times 6 \times 8} + \dots$$

*Or,*

Divide 12345678 by 09876543, correct to four places of decimals.

1918

#### COMPULSORY PAPER.

1. (1) *Either*, Multiply 390626 by 331779.

*Or,*

Find the G. C. M. of 78657 and 90275.

(2) A reservoir contains 218,703 gallons of water. How many cisterns, each holding 37 gallons, can be filled out of it, and how many gallons will be left in it when they are all full?

C. A. 25

2. (1) Simplify  $\frac{\frac{1}{2} + \frac{2}{3} + \frac{1}{15}}{\left(\frac{5}{6} - \frac{3}{14}\right) \times 1\frac{2}{15}}$ .

(2) Simplify  $(1.4 - 0.362) \div (0.31 + 0.123 - 0.0005)$ .  
(Express the result in decimals.)

3. (1) *Either*, What will be the cost of paper 20 in. wide, at  $3\frac{1}{4}$  d.  
a yard, for the walls of a room 21 ft long, 15 ft. wide, and 10 ft. high?

*Or*, Find the cost of 5 cwt. 2 qrs 14 lb. of butter at £2 5s. 6d per cwt.

(2) *Either*, What sum of money will amount to Rs. 1,352. 4a. in three years at  $4\frac{1}{2}$  per cent. simple interest?

*Or*,

A garrison of 420 have food enough to last them 35 days. After 5 days they are reinforced by 210 men, bringing no food with them. How much longer will the food last?

#### ADDITIONAL PAPER.

1. (1) Find the square root of 1000014129.

(2) Find the dimensions of a tank which is 2 56 metres deep and which holds 3,000 litres, the length of the tank being three times the width.

2. *Either*, Find the value of

$$\frac{1}{2} + \frac{2}{30} + \frac{3}{400} + \frac{4}{5000} + \dots, \text{ correct to four places of decimals.}$$

*Or*, Find the value of  $\frac{0.34567 \times 0.73456}{0.67345}$ , correct to four places of decimals.

1919.

#### COMPULSORY PAPER.

1. *Either*, (1) Multiply 908076 by 6700809

(2) Find the G. C. M. of 96577 and 448477.

*Or*, (1) Divide 4599559845 by 90705.

(2) Find the L. C. M. of 289, 323, and 361.

2. (1) Simplify  $\frac{\frac{2}{3} + \frac{3}{4}}{\frac{5}{6} - \frac{7}{8}}$  of R. 1. 10a. 8p. - 0.125 of 0.16 of Rs. 23.

(2) What decimal of an hour is a second?

3. (1) Find the price of 17 cwt. 3 qrs. 14 lb. of sugar at £2. 9s. per cwt.

(2) In how many years will Rs. 5,000 amount to Rs. 6,100 at  $5\frac{1}{2}$  per cent. per annum simple interest?

## ADDITIONAL PAPER.

1. *Either*, Multiply 5947.183 by 0.093187 by a contracted method so as to retain four places of decimals only.

*Or*, Find the value of the following series correct to three places of decimals :

$$\frac{1}{1} + \frac{1}{1 \times 5} + \frac{1}{1 \times 5 \times 9} + \frac{1}{1 \times 5 \times 9 \times 13} + \frac{1}{1 \times 5 \times 9 \times 13 \times 17} + \dots$$

2. *Either*, Find the square root of 0.08042896.

*Or*, Find the cost of constructing a path 4 ft. wide round a rectangular courtyard 10 yds long and 7 yds broad, if each square foot costs 2a. 6p.

1920.

## COMPULSORY PAPER.

*Either*, (1) Multiply 80070430 by 34070080

(2) Find the G. C. M. of 47821 and 68191

*Or*, (1) The dividend being 545322774 and the quotient 89706, find the divisor

(2) Find the least number which is exactly divisible by the first nine integers

2. (1) Simplify  $\frac{6\frac{7}{8} + 3\frac{1}{8}}{6\frac{7}{8} - 3\frac{1}{8}} - 10\frac{1}{4}$  of  $\frac{1}{3}$ .

(2) Express 0.16 of 2 cwt. 2 qrs + 0.16 of 2.6 cwt. as the fraction of one ton. Convert the fraction into a recurring decimal.

3. (1) Find the rent of 19 acres 3 roods 20 square poles of land at £4. 5s. per acre.

(2) What sum will amount to Rs. 6375 in 5 years at  $5\frac{1}{2}$  per cent. per annum simple interest?

## ADDITIONAL PAPER.

1. *Either*, Find by a contracted method the value of

$$0.53209853 \times 0.43429448$$

correct to seven places of decimals

*Or*, Find correct to four places of decimals the value of  $\frac{\sqrt{7} - \sqrt{5}}{\sqrt{7} + \sqrt{5}}$ .

2. *Either*, A clock in the kitchen loses at the rate of 6.5 seconds an hour when the fire is alight, and gains at the rate of 3.9 seconds an hour when the fire is not burning; but in the whole day it neither gains nor loses. How long in the twenty-four hours is the fire burning?

*Or*, 40 per cent. of the gross receipts of a tramway company is taken up in meeting the working expenses, 40 per cent. of the remainder goes to the

reserve fund, and the balance is paid away as dividends to shareholders at the rate of  $3\frac{1}{2}$  per cent. on their shares, the total value of which is Rs. 864000 ; find the amount of the gross receipts.

1921

## COMPULSORY PAPER.

1. *Either,* (1) The divisor being 102003 and the quotient 45067, find the dividend

(2) Find the G. C. M. of 65569 and 94829

*Or,* (1) Divide 6579820764 by 98076.

(2) Four bells begin tolling at the same time, and they toll at intervals of 12, 18, 24, and 30 seconds respectively. After what interval of time will they next toll at the same time ?

2. (1) Simplify  $\frac{2\frac{2}{3} - 3\frac{4}{5} + 4\frac{5}{6}}{7\frac{1}{4} \div 1\frac{1}{3} \text{ of } 1\frac{1}{2}}$  of  $\frac{1}{2\frac{1}{2}}$ ,

expressing the answer (1) as a fraction, and (ii) as a recurring decimal.

(2) A post has half of its length in mud, one-third of its length in water, and ten feet above water. Find the whole length of the post.

3. (1) Find the price of 25 maunds 15 seers 5 chataks of rice at Rs. 12.8 as per maund.

(2) At what rate per cent per annum simple interest will Rs. 6000 amount to Rs. 7650 in 5 years.

## ADDITIONAL PAPER.

1. *Either,* Find the diagonal of a rectangle whose sides are 2.56 cm and 4.73 cm.

*Or,* The third class railway fare in France is 5 centimes per Kilometre and in England 1d. per mile. Given that 1 yard = 0.9144 metre and £1 = 25.17 francs, find (in English money) the difference of the fares for a journey of 100 miles in the two countries, correct within a farthing.

2. *Either,* find the product of 273065 and 0.0094738, preferably by a contracted method, correct to four places of decimals

*Or,* Divide £1852 between A, B, and C, so that A may have 0.615 of the whole, and B 0.615 of what is left, and C the remainder to the nearest pound.

1922

## COMPULSORY PAPER.

1. *Either,* (1) Multiply 70050230 by 5200780.

(2) Find the G. C. M. of 34465 and 54900.

*Or,* (1) What number multiplied by 238 gives the same result as 408 multiplied by 350 ?

(2) Find the least number that can be divided by all the even numbers up to 20 inclusive.

2. (1) Simplify  $\frac{2\frac{1}{8} \text{ of } \frac{1}{8}}{\frac{1}{8} \text{ of } \frac{6}{15} - 5\frac{1}{8}} - (\frac{1}{8} \text{ of } 1\frac{1}{8})$ .

(2) Find the value of

$$0.2 \text{ of } 3\frac{1}{2} \text{ of } 81 - 1.6 \text{ of } 3.4 - 3.96.$$

3. (1) *Esther*, (1) Find the price of 3 tons 3 cwt. 3 qrs 14 lb. at £. 3s 4d. per ton

Or, (1) Find the price of 1448 articles at 10s 8d. each.

(2) What sum will amount to Rs 915 in 4 years at 5 $\frac{1}{2}$  per cent. per annum simple interest?

#### ADDITIONAL PAPER

1. *Esther*, Extract the square root of 1522756.

Or, Extract the square root of 0.225 correct to 3 places of decimals.

2. *Esther*, Find the sum, correct to 3 places of decimals, of the series

$$1 + \frac{1}{1} + \frac{1}{1 \times 2} + \frac{1}{1 \times 2 \times 3} + \frac{1}{1 \times 2 \times 3 \times 4} + \dots$$

Or, the price of cloth having been raised 75 per cent., how much per cent. must a householder reduce his consumption of that article so as not to increase his expenditure?

1923

#### COMPULSORY PAPER.

1. *Esther*, (1) Multiply 3805800 by 708009

(2) Find the G. C. M. of 34465 and 54900

Or, (1) How often can you subtract 46 from 533006, and what is the final remainder?

(2) Find the least number which will leave a remainder 4 when divided by both 15 and 18

2. (1) Simplify  $\frac{2\frac{3}{8} + 5\frac{7}{8}}{1\frac{1}{2} - \frac{4}{9}} - \left(\frac{1}{8} \text{ of } \frac{3\frac{1}{2}}{4}\right) \times \frac{2\frac{3}{16}}{32}$ .

(2) Find the value of

$$0.4 \times 2.5 - 0.3 + 0.75 \text{ of } 4 - 2.4 - 0.4.$$

3. (1) Find the price of 12 mds 8 srs. 4 ch. at Rs 36. 4 as per md.

(2) In what time will a sum of money double itself at 5 per cent. per annum, simple interest being charged?

#### ADDITIONAL PAPER

1. *Esther*, Extract the square root of 2819041

Or, Extract the square root of 0.051 correct to 3 places of decimals.

2. *Either*, Find the sum, correct to 3 places of decimals, of the series

$$1 - \frac{1}{1} + \frac{1}{1 \times 2} - \frac{1}{1 \times 2 \times 3} + \frac{1}{1 \times 2 \times 3 \times 4} - \dots$$

*Or*, By selling a house for £2,575 a man gains 12 per cent. on his original outlay. How much per cent. would he have gained had the house cost him £100 less?

1924.

## COMPULSORY PAPER.

1. *Either*, (1) What number multiplied by 9706 will give 5513008 as product?

(2) Find the G. C. M. of 11044 and 13464.

*Or*, (1) How often is the difference of 1325 and 1590 contained in their sum?

(2) Find the least number of rupees that can be divided among 8, 12, or 15 men

2. (1) Simplify  $\frac{2\frac{3}{5} - 1\frac{2}{5}}{2\frac{4}{5} + \frac{3}{5}} + \frac{1\frac{1}{4}}{14\frac{2}{3}} - \frac{1\frac{1}{4}}{1\frac{5}{7}}$ .

(2) By what must 10035 be divided to get 3?

3. *Either*, (1) Find by practice or otherwise, the cost of 8 mds 15 srs. 10 ch. of rice at Rs 5 5a 4p per md.

(2) How much carpet 2 ft. wide will be required for a room 7 yds long and 16 ft. wide?

*Or*, The sum of Rs. 425 was lent at simple interest. At the end of 9 months the debt was cancelled by the payment of Rs. 437. 12a. What was the rate of interest?

## ADDITIONAL PAPER.

1. *Either*, Extract the square root of 184389241.

*Or*, A house was sold for Rs. 4,500 at a profit of  $12\frac{1}{2}$  per cent. What per cent would have been lost if it had been sold for Rs. 3,800?

2. *Either*, Find the sum, correct to 5 decimal places, of the series

$$\frac{1}{1} \times \frac{1}{10} + \frac{1}{2} \times \frac{1}{10^2} + \frac{1}{3} \times \frac{1}{10^3} + \frac{1}{4} \times \frac{1}{10^4} + \dots$$

*Or*, Rs. 49 12a. was divided amongst 150 children so that each boy received 8a. and each girl 4a. How many boys were there?

## II. UNIVERSITY OF MADRAS. ENTRANCE PAPERS.

1886.

(N.B.—Answers in money must be stated in £. s. d. or in R. a p. as the case may be, and not as fractions of £1 or of R1.)

1. State and explain the rule for the multiplication of vulgar fractions.

Simplify  $\frac{2}{3} \left( \frac{1}{2} - \frac{3}{5} \text{ of } \frac{1}{4} \right) + \frac{1}{17} \times \frac{\frac{2}{3} + \frac{2}{3}}{\frac{3}{4} - \frac{2}{3}} - 20.$

2. Express £66. 14s. 5d. as the decimal of Rs. 1,000, the rupee being worth £s. 4 $\frac{1}{2}$ .

3. Distinguish between pure and mixed recurring decimals.

Find the value of 0.945 of £2. 3s. 6 $\frac{1}{2}$ d. + 0.37259 of £1. 8s. 1 $\frac{1}{2}$ d.

4. Find by any method the rent of 156 ac. 3 r. 24 p. 11 sq. yd. at Rs. 25. 3a. 4 $\frac{1}{2}$  per acre.

5. A clock which gains 3 m. 56 s. in 24 hr. was set correctly at noon on the 1st of January 1884. Find to the nearest minute the next date at which it indicated correct time.

6. Twenty men are employed to make a tank 40 ft long, 20 ft. broad, and 6 ft. deep. They work for 30 days and have just completed one third of the work, when it is resolved to increase the length of the tank by 10 ft., the breadth by 4 ft. and the depth by 2 ft. How many additional men must be employed in order that the work may be completed in 30 days more?

7. The difference between the simple and compound interest on a sum of money for 3 years at 5 per cent. is £7 12s. 6d. Find the sum.

8. The capital of a certain railway is £1000000 in 20000 shares of £50 each, fully paid up. The gross annual receipts are £105000 of which 48 per cent. is absorbed in working expenses, £4600 goes to the reserve fund, and the remainder to pay dividend. Find what annual income a person will obtain from the investment of £4500 in the undertaking, the shares being at £62 10s.

9. Ice is manufactured for 6 pds a pound. Two-thirds of the quantity made is kept for sale at the factory and the remainder is sent to branch shops. If the average loss from melting of the former be 12 $\frac{1}{2}$  per cent. and that of the latter be 25 per cent., find the gain on every ton made.

10. The average width and depth of a river at its mouth are 240 yd. and 6 feet respectively, the average rate of flow is 3 miles per hour, and the amount of sediment per cubic foot of water discharged is 1 $\frac{1}{2}$  cubic inches. Find the amount of sediment deposited annually, and the depth of the deposit, supposing it spread uniformly (i.e., to the same depth throughout) over an area of 146 square miles.

1888.

$$2. \text{ Simplify } \frac{6\frac{3}{5} - 4\frac{1}{5}}{5\frac{1}{5} - 4\frac{6}{5}} = \frac{2\frac{2}{5} \div 1\frac{1}{5} + 1\frac{1}{4} - 1\frac{9}{10} \text{ of } 3\frac{1}{2}}{\frac{4}{5} \times 3\frac{5}{6} - 5\frac{3}{5} + 3\frac{4}{5}} \times 13\frac{1}{2}.$$

3. Find the value of  $1\frac{3}{17}$  of '01236 of R5. 11s. 8p.; and taking the rupee as worth 1s. 4 $\frac{1}{2}$ d., express the result as the decimal of one shilling.

4. Find by any method the value of 9 tons 17 cwt. 3 qr. 25 lb. of coffee at £72. 18s. 4d. per ton.

5. When iron is at £3 7s 6d. a ton, the cost of laying a railway 10 miles 2 fur. 20 po. in length with rails weighing 270 lb. each is R67,500. Find the cost of laying a railway 25 miles 220 yd. long with rails of the same length weighing 500 lb. each, when iron is at £3. 14s. 3d. a ton.

6. Find the present value of £482. 6s 10 $\frac{1}{2}$ d. due 3 years hence at 5 per cent compound interest.

7. When exchange is at the rate of 1s. 4 $\frac{1}{2}$ d. per rupee, a person in Madras orders from a bookseller in England a parcel of books, the published price of which is £5. The bookseller allows discount at the rate of 25 per cent on the published price, but includes in his bill a charge of 13s. for packing, freight, &c. When the books arrive in India, a further sum of R2 8s. has to be paid on account of landing charges and cost of delivery. If the books can be obtained from a bookseller in Madras at the rate of 9 $\frac{1}{2}$  annas per shilling of the published price, find how much the person loses by ordering from England.

8. A person holds forty R500 shares in a concern which pays dividend at the rate of 6 per cent. per annum. When the shares are at R675, he sells out and invests half the proceeds in 4 per cent. stock at 90. With the other half he buys a house, for which he receives an annual rental of R1,440, subject to a deduction of 3s. 9p. per rupee for repairs and taxes. Find the alteration in his annual income.

9. In a certain year a country produces 50,000,000 bushels of wheat. Of this quantity 40 per cent is available for export at R3. 2s. per bushel. In the following year the acreage under wheat has increased 20 per cent, but the yield per acre is only seven-eighths of what it was in the previous year, while the quantity required in the country has increased 5 per cent. If at the same time the export price has fallen to R3 per bushel, find the increase in the value of the wheat available for export.

10. The population of a country is 33,264,000, and there are 99 males to 101 females. 2 out of every 11 boys and 1 out of every 33 girls of school-age are under instruction. If the boys of school-age form one-seventh of the male population and the girls of school-age form one-seventh of the female population, find the total number of pupils under instruction.

1889.

2. Simplify  $\frac{\frac{1}{2} + \frac{1}{3} - (\frac{1}{7} - \frac{1}{8})}{(\frac{1}{2} + \frac{1}{3}) \div \frac{1}{7} - \frac{1}{8}} \cdot \frac{1\frac{1}{2} + \frac{3}{2}}{1\frac{1}{2} - \frac{1}{8}} - \frac{1}{2} \text{ of } \frac{1}{3}$ .

3. Multiply 41'36514 by '0019, expressing the result as a decimal; and find the value of '3472 of £1. 4s. - '03288 of £2. 6s. 3d.

4. Find by any method the cost of 79 ca. 17 m. 5 v. 25 pal. of salt at R21. 10s. 8p. per candy.

5. The cost of rice for a family of 2 adults and 3 children from January 1st, 1889, to December 11th, 1889, both days inclusive, during which time rice was selling at 15 4 seers per rupee, was Rs 70 7a. What will be the cost of rice for a family of 3 adults and 5 children from December 19th, 1889, to May 11th, 1890, both days inclusive, assuming that the price of rice will be 14 7 seers per rupee, and assuming also that the quantity required per day by each adult is the same in both cases, and that in both cases the quantity required by a child is two-fifths of the quantity required by an adult?

6. On what sum due 1 year 4 months hence does the true discount amount to £100. 18s. 9d., simple interest being reckoned at 4 $\frac{1}{2}$  per cent. per annum?

7. How much 3 per cent stock must a person sell when the selling price is 91, in order that by investing the proceeds in the 4 $\frac{1}{2}$  per cents at 113 $\frac{1}{2}$  he may derive from the investment an annual income of Rs 9817. 8a., after paying income-tax at the rate of 5 pies per rupee?

8. A and B can do a piece of work in 10 days, B and C in 15 days, and C and A in 20 days. They all work at it for 6 days; then A leaves, and B and C go on together for 4 days more. If B then leaves, how long will C take to complete the work?

9. In a certain year the total amount received by a railway company for the carriage of passengers was Rs 2751000. Of this sum 6 per cent was contributed by first class passengers, 5 per cent by second class, and the remainder by third class. The fares were 18, 6, and 1 $\frac{1}{2}$  pies per mile for first, second and third class passengers respectively. Assuming that the average distance travelled by each third class passenger was 36 miles, and the average distance travelled by each passenger of the other classes was 160 miles, find the total number of passengers carried during the year.

10. The length of rectangular field is twice its breadth. If the rent of the field at £3 7s. 6d. an acre is £151. 17s. 6d., find the cost of surrounding it with a fence at 4 $\frac{1}{2}$ d. per yard.

11. Extract the cube root of 9 to five decimal places.

## 1890

1. Reduce 2149908480 sq. inches to acres, etc. If this is the area of a rectangle the length of which is 5 m. 7 fur. 5 p. 1 ft. 6 in., find its breadth.

2. Simplify  $\frac{1835}{2202} + \frac{5468}{12303} + \frac{147}{441} - 3\frac{3}{7} \text{ of } \frac{6.25}{5.5} \text{ of } \frac{.04}{1.285714}$

3. Find the value of 237 candies 17 maunds 6 viss at Rs 4100 1a. 4p. per candy.

4. 300 coolies are set to build a tank-bund. In 14 weeks they have done  $\frac{1}{5}$  of the work when rain stops the work for 4 weeks and washes away  $\frac{2}{3}$  of what they have done. At the end of that time the work is resumed with only 250 coolies. In what time from the commencement will the work be finished?

5. Find the amount of Rs 5859375 for 3 years at 4 $\frac{1}{2}$  per cent. per annum, reckoning compound interest

6. Explain the difference between discount and interest. If the discount on £2830. 15s. 7 $\frac{1}{2}$ d. be equal to the simple interest on £2784. 7s. 6d. for the same time, find the time, the rate of interest being 5 per cent. per annum.

7. A person invests £34539 in the 3 per cents at 87. After receiving one year's dividend he sells out at 89. He then invests the whole in Railway stock, paying 5 per cent., at 115. What will the difference in his income be?

8. A cistern 10 ft. 6 in. long by 7 ft. 6 in. wide by 3 ft. 4 in. high is lined inside with lead, 7 lb. of which cover a square foot. Find the weight of the lead and its cost at 53s. 4d. per cwt.

9. A cask contains 16 gallons of spirit. Two gallons are drawn off and the cask filled up with water. Two gallons are again drawn off and the cask filled up as before. This is done a third time. Compare the quantities of spirit and water remaining in the cask.

10. Find the square root of 379749833.583241.

### 1891.

2. Subtract 13 times Rs 17. 6a. 11p. from 17 times Rs 13. 6a. 11p.

3. Rs 330. 3a. 7p. are to be divided among 193 persons, two of whom receive Rs 2 each, and ten Rs 3 each. The others receive equal shares. Find the value of each share.

4. Find the value of  $\frac{\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}}{\frac{1}{2} - \frac{1}{3} + \frac{1}{4} - \frac{1}{5}} \times 3\frac{1}{2} \div \frac{\frac{1}{5} + \frac{1}{6} + \frac{1}{7}}{\frac{1}{5} - \frac{1}{6} + \frac{1}{7} - \frac{1}{8}}$

and simplify (without reduction to vulgar fractions if you can)

$$2.03 + 1.345 + 27.34 + 16.2317.$$

5. How long will it take to walk round a square field 14 acres 1 rood 24 poles in extent at the rate of 3 miles an hour?

6. Find the cost of white-washing a room 22 $\frac{1}{2}$  ft. by 12 ft. and 11 ft. high, at one anna per square yard, making allowance for four windows each 4 ft.  $\times$  2 $\frac{1}{2}$  ft. and two doors each 8 $\frac{1}{2}$  ft.  $\times$  4 ft. Find also the cost of a carpet for the same room with 3 ft. border all round the carpet, costing Rs 4 per square yard and the border Rs 6 per square yard.

7. Find the compound interest on £3143. 6s. 8d. for 3 years at 3 per cent. per annum.

8. A cistern can be filled by three pipes in 30, 40 and 60 minutes respectively, and emptied by an escape pipe in half an hour. The three taps are turned on at noon, but the escape pipe is at the same time accidentally left open and not closed for a quarter of an hour. At what time will the cistern be full?

9. I purchase 16 lb. of tea at 1s. 7d. per lb., 14 at 2s. 2d. and 17 at 1s. 8d. Seven pounds of the mixture becoming spoiled have to be sold at

a low price, but by selling half the remainder at 2s. 4d. per lb. and the other half at 2s. 7 $\frac{1}{2}$ d., I eventually make a profit of 25 per cent. on the original outlay. At what price per pound was the spoiled tea sold?

10 A person invests a sum of money in the 4 per cents. at 102. When they have risen to 104, he transfers Rs6000 stock to another investment paying 5 per cent. of which the shares are at 120. When the 4 per cents. fall to par, he transfers the remainder to the 5 per cents. which are still at the same price and now finds his income Rs25 more per annum than it was at first. What was the sum originally invested?

### 1892.

2. Simplify  $\frac{\frac{5}{7} \text{ of } 1\frac{1}{2} - \frac{5}{7} \text{ of } \frac{5}{7}}{1 - \frac{1}{7} \times (\frac{1}{2} + \frac{5}{7})} \times \frac{\frac{1}{2} + \frac{5}{7} - (\frac{1}{2} - \frac{5}{7})}{(\frac{1}{2} + \frac{5}{7}) - \frac{1}{7} - \frac{5}{7}}$

3. Find the value of '0416 of £33 7s. 6d. - 0345 of £32 13s. 1 $\frac{1}{2}$ d.; and express Rs371 2a. 6p. as the decimal of a lakh of rupees.

4. Find by any method the cost of making a road 37 m. 6 f. 31 p. 3 yd. long at Rs1785 3a. 4p. per mile.

5. Find the present value of £482 6s. 10 $\frac{1}{2}$ d. due three years hence at 5 per cent per annum compound interest.

6. Extract the square root of 13.697142031225 to six places of decimals.

7. The annual rainfall of a district is 49 7 inches. Assuming that the fall is distributed uniformly over the district, and that a cubic foot of water weighs 62 5 lb., find the weight in tons of the rain that falls throughout the year on a square mile.

8. When exchange is 1s 2 $\frac{1}{2}$ d. per rupee, a Madras bookseller sends to a London publisher a bill for £104 in payment of books ordered. Freight and landing charges amount to Rs7 8a. The publisher allows the bookseller discount at the rate of 35 per cent on the published price, and the latter sells the books at the rate of 10 $\frac{1}{2}$  annas per shilling of the published price. Find how much he gains on the transaction.

9. In the year 1891, the cost of rice for a family of 2 adults and 4 children was Rs6 7a. 9p. In that year rice sold at 11 $\frac{1}{2}$  seers per rupee, and each child received two-fifths of the amount given to an adult. Assuming that in 1893 the price of rice will be 13 5 seers per rupee, what will be the cost of rice for the same family from January 5 to August 11, both days inclusive, if the allowance of each adult be increased by one-fourth and the allowance of each child be three-sevenths of that of an adult?

10. The capital of a railway company amounts to Rs18,90,00,000 of which one-fourth is 5 per cent. preference stock and one-third 4 $\frac{1}{2}$  per cent. preference stock. In a certain year the receipts are Rs1,81,50,000, and the working expenses amount to 55 per cent. of the receipts. Of the net receipts Rs5,40,000 are added to the reserve fund, and the remainder, after paying dividend on the preference stock, is divided among the ordinary shareholders. What rate of interest will they receive?

11. In the ten years from 1871 to 1881 the population of a country increased at the rate of 9.5 per cent., and in the ten years from 1881 to

1891 the rate of increase was 10·5 per cent. If the population in 1891 was 31,023,759, find what it was in 1871.

## 1894.

2. Simplify  $\frac{\frac{3}{4} - \frac{1}{2} \text{ of } \frac{7}{8} + \frac{3}{5}}{\frac{4}{5} - \frac{5}{7} - \frac{1}{6} + \frac{2}{3}} - \frac{\frac{1}{12} - \frac{4}{9}}{1 - \frac{8}{9} - \frac{3}{5}}.$

3. Find the value of 2·04752 of £2. 2s. 1d. - 1·734375 of £2. 6s. 8d.

4. Find by any method the value of 59 ca. 14 m 7 v. 27 pal. of salt at R26, 10a. 8p per candy.

5. In a certain year the produce of a tea-estate was sold in London at an average rate of 9 $\frac{1}{2}$ d. per lb., and the amount realised was remitted at an average rate of exchange of 1s 2 $\frac{1}{2}$ d. per rupee. In the following year the average price realised was only 8 $\frac{3}{4}$ d. per lb., but the quantity sold exceeded by 12 $\frac{1}{2}$  per cent. the quantity sold in the previous year and the average rate of exchange at which remittances were made fell to 1s 1 $\frac{1}{2}$ d. If in this year the total amount realised from sales in London was R105000, find how much was realised in the previous year.

6. A sum of money was invested for four years, interest payable annually. The rate of interest was 5 per cent. per annum for the first two years and 4 per cent. per annum for the last two; and the amount at the end of four years was £1,164 10s. 3 $\frac{3}{4}$ d. What was the sum invested?

7. Ice is manufactured for 2 $\frac{1}{2}$  pies per lb. and sold at 6 pies per lb. Of the total quantity made one-half is kept for sale at the factory, and the remainder sent to branch shops. The loss from melting is 12 $\frac{1}{2}$  per cent. in the case of the former and 25 per cent. in the latter; and the agents at the branch shops receive commission at the rate of 15 per cent. on the price of every pound sold by them. Find the profit on every ton of ice manufactured.

8. Two persons, A and B, set out together on a journey. They walked at the rate of 3 miles an hour; and after they had proceeded for three quarters of a mile, B returned, walking at the same rate, to the place of starting. Here he was detained three quarters of an hour. Setting out again he overtook A, who had been walking all the time, at the end of 2 $\frac{1}{2}$  hours from the second time of starting. At what rate did he walk?

9. A person sold 25 Bank of Madras shares and invested the proceeds in the Government 3 $\frac{1}{2}$  per cents when they were at 3 $\frac{1}{2}$  premium. If his net annual income from the investment, after paying income-tax at the rate of 5p in the rupee, be R876. 9a., find the price at which he sold each of his bank shares.

10. In the year 1891 the population of a country was 35640000 and there were 1025 females to every 1000 males. Of the total population 7·5 per cent. could read and write, but of the females only 1 per cent. could do so. Find what percentage of males could read and write.

11. Extract the square root of 81·13183159704101 to seven places of decimals.

1895.

2.  $\frac{1}{2} \text{ of } \frac{4}{5} - \frac{1}{2} \text{ of } 1\frac{2}{3} - \frac{5}{6} \quad \frac{2\frac{1}{2} - \frac{5}{6} \text{ of } 2\frac{2}{3}}{\frac{5}{6} + \frac{1}{2}(\frac{5}{6} - \frac{1}{2}) - \frac{5}{6} \text{ of } 1\frac{2}{3} - 1\frac{1}{4} - \frac{1}{2} - 3}$ .

3. Find the value of  $041962 - 936$ , expressing the result as a decimal.

4. Find the value of 97 miles 5 furlongs 170 yards of wire at Rs 34. 6a. op. per mile.

5. When iron was at £2 14s 2d. per ton and the rupee at 1s 7½d., the cost of laying a railway with iron rails weighing 50 lbs. per yard was Rs 278,250. Find what will be the cost of relaying it with steel rails weighing 75 lbs. per yard, when the price of steel is £3 17s 6d. per ton and the rupee is at 1s 1½d.

6. The reservoir from which a certain city draws its water supply has a surface area of  $2\frac{1}{2}$  square miles. If the city has a population of 450,000, and if the average daily supply is at the rate of 20 gallons to each inhabitant, find what must be the average depth of the reservoir so that when full it may contain a year's supply. (1 gallon = 277.274 cubic inches, and a year = 365 days)

7. Find what sum will amount to £669 10s. 3½d. in 2 years at 3½ per cent compound interest, payable annually

8. The capital of a certain railway is 275 lakhs of rupees in shares of Rs 500 each, fully paid up. The gross receipts in a certain year amounted to 22½ lakhs, and the working expenses amounted to 48 4 per cent of the gross receipts. Of the net receipts the sum of Rs 131,400 was placed in the reserve fund and the remainder went to pay dividend. Find the amount of dividend received by a person holding 1500 shares, after deducting income-tax at the rate of 50 per rupee

9. Rupee silver is an alloy consisting of 11 parts of silver to 1 part of copper, and the weight of 1 rupee is 180 grains. If the price of silver is 25 6d. per oz. troy, the price of copper 3½d. per lb troy, and if the rate of exchange is 1s 1½d. per rupee, find the total value in rupees of the silver and copper required for coining a lakh of rupees.

10. A merchant pays a lakh of rupees for a season's goods. He marks the goods 25 per cent over prime cost, and from what he sells at this rate realises Rs 112,500. At the end of the season he sells the remaining goods at reduced rates, one half at a reduction of 25 per cent on the former prices, one quarter at a reduction of 50 per cent, and the remainder at a quarter of the former prices. If the expenses of the business amount to 12 per cent of the sale receipts, what is his rate of profit on the transactions of the season?

11. Find the dimensions of a cubical cistern having the same capacity as a tank 31 feet 6 inches long, 21 feet broad and 1 foot 9 inches deep.

1896

2. Simplify  $\frac{3\frac{7}{9} - 2\frac{1}{3} \times \frac{1}{2} + 2\frac{2}{3} \text{ of } (2\frac{1}{2} - 1\frac{1}{2})}{2\frac{1}{2} + 3\frac{1}{3} - \frac{5}{6} \text{ of } 10\frac{1}{2}} - \frac{1\frac{1}{2} \text{ of } 2\frac{2}{3}}{5\frac{5}{12} - 2\frac{2}{3}}$

3. Prove that any number of pies can be expressed as thousandths of a rupee by multiplying the number by 5 and adding to the product  $\frac{1}{2}$  of itself. Apply this rule to express 6a. 9p. as the decimal of a rupee, and verify the correctness of your result, obtaining it in another way. - Find the value of '0012376 of a lakh of rupees.

4. Find by any method the cost of constructing a railway 329 miles 5 fur. 176 yds. long at R77,386. 13a. 4p. per mile.

5. A contractor undertook to finish a certain piece of work in 150 days. He employed 20 men, 30 women and 75 children; but at the end of 60 days, finding that only one-fourth of the work was done, he dismissed all the women and 50 of the children and employed more men. The work was then finished 5 days before the stipulated time. Assuming that 3 men could do as much as 5 women, and 2 women as much as 3 children, find how many additional men were employed.

6. Find the present value of R1115. 13a. 9p. due 2 years hence at  $3\frac{1}{2}$  per cent. per annum compound interest.

7. How much  $3\frac{1}{2}$  per cent. stock of  $109\frac{1}{2}$  must a person sell in order that by investing the proceeds in 3 per cent. stock at  $103\frac{1}{2}$  he may derive from the investment an annual income of R6825. 8a., after paying income-tax at the rate of 5 pies in the rupee?

8. A grocer imports sugar at 15s. 4d. per cwt., the cost of which he remits when exchange is at the rate of 1s.  $2\frac{3}{4}$ d. per rupee. Freight and landing charges amount to R38 6a. per ton, and import duty at the rate of 10z. 6p. per cwt. has also to be paid. At what rate per maund of 25 lb must the grocer sell the sugar so as to gain 12 per cent. on his total outlay?

9. In a certain year the total value of the exports from the Presidency of Madras showed an increase of 12.5 per cent. as compared with the total value of the exports for the previous year. Of the various items of export, coffee which in the first of these two years represented 13.59 per cent. of the total value of the export, showed an increase of 7.5 per cent. What percentage did coffee represent of the total value of the exports in the second of the two years?

10. In a certain year the quantity of wheat raised in a country was 54,000,000 bushels. Of this one-third was available for export at R2 4a per bushel. In the following year the acreage under wheat showed an increase of 20 per cent., but the yield per acre was only three-fourths of what it was in the previous year, and of the total quantity of wheat raised only one-fourth was available for export. If the value of the wheat exported in this year was  $101\frac{1}{2}$  lakhs of rupees less than in the previous year, what was the export price of wheat per bushel?

11. Extract the square root of 4985.067295890281 to 6 places of decimals.

1897.

2. Simplify  $\frac{\frac{5}{7} \text{ of } 2\frac{5}{6} - \frac{3}{7} \text{ of } 3\frac{1}{3}}{\frac{5}{7} \text{ of } 2\frac{2}{3} \text{ of } 1\frac{2}{7} - 1\frac{2}{3}} \div \frac{4\frac{1}{4} - 3\frac{1}{2}}{4\frac{1}{4} \div \frac{1}{3}}$ .

3. Find the value of  $875$  of  $R4. 5a. 4p.$  +  $859375$  of  $R1. 5a. 4p.$  -  $5740$  of  $R3. 1a. 6p.$

4. Find by any method the value of  $21$  tons.  $17$  cwt.  $2$  qr.  $23$  lb. of coffee at  $R1547. 4a. 8p.$  per ton.

5. When the price of grain is  $11$  measures per rupee, the cost of grain for  $24$  ponies for  $31$  days is  $R182. 2a.$  Assuming that  $5$  horses require as much as  $8$  ponies, find the cost of grain for  $25$  horses for  $6$  weeks when the price is  $10\frac{1}{2}$  measures per rupee

6. The interest on a certain sum of money for  $3$  months at  $5$  per cent. per annum exceeds the true discount on the same sum due  $3$  months hence at the same rate of interest by  $1a. 3p.$  Find the sum

7. A person holding  $60$  shares in a concern which paid dividend at the rate of  $5$  per cent. per annum, sold out when the shares were at  $R625$  and invested half the proceeds in  $3\frac{1}{2}$  per cent. Government paper at  $105$ . With the other half he bought a house, for which he received an annual rental of  $R1920$ , subject to a deduction of  $4a. 3p.$  per rupee for repairs and taxes. Find the alteration in his annual income

8.  $50$  men,  $100$  women and  $150$  children, working for a certain time on a tank-bund earn together  $R11d. 4a.$  If the wages of a man, a woman and a child be  $4a.$ ,  $2a. 6p.$  and  $1a. 6p.$  per day respectively, find how much is earned on the whole by each man, woman and child.

9. A merchant buys a quantity of tea at an average rate of  $12a. 6p.$  per lb. He assorts the tea into three kinds, which he sells at  $R1. 2a., 14a.$  and  $16a.$  per lb respectively. If in the process of assortment  $2\frac{1}{2}$  per cent. of the tea is lost, and if of what remains  $36$  per cent. is of the dearest kind and  $24$  per cent. of the cheapest, find the merchant's gain per cent. on the transaction

10. A merchant in Madras owes  $12,270$  marks to a merchant in Hamburg. If exchange on Hamburg is at the rate of  $1.32$  marks per rupee, while exchange on London is at the rate of  $1.34d$  per rupee, and the exchange between London and Hamburg is  $20.45$  marks per pound sterling, find, to the nearest pie, how much the merchant will gain by remitting through London instead of direct.

11. The length of a field containing  $21$  ac.  $3$  ro.  $25$  sq. po.  $3\frac{1}{2}$  sq. yds. is twice its breadth. Find the length of the field.

1898

2. Simplify 
$$\frac{8\frac{1}{2} - 7\frac{1}{2} + 6\frac{1}{2} - 5\frac{1}{2}}{(4\frac{1}{2} + 3\frac{1}{2}) - (3\frac{1}{2} + 2\frac{1}{2})} - \frac{\frac{1}{2} - \frac{1}{2}}{\frac{1}{2} \times \frac{1}{2}}.$$

3. Find the value of  $11481$  of  $R9. 13a. 6p.$  and express the difference between  $\frac{1}{2}$  of  $R37. 13a. 4p.$  and  $\frac{1}{2}$  of  $R37. 2a.$  as the decimal of  $R50.$

4. Find the cost of paving a rectangular area  $35$  feet  $9$  inches long and  $23$  feet  $6$  inches broad at the rate of  $R5. 13a. 6p.$  per square yard.

5. Two watches, one of which gained at the rate of  $1$  minute  $54.6$  seconds and the other lost at the rate of  $1$  minute  $55.8$  seconds daily, were

set correctly at noon on the 1st of January, 1896. When did the watches next indicate the same time and what time did each indicate?

6. Find what sum will amount to R $7364.10a.9\frac{1}{2}p$ . in two years at  $3\frac{1}{2}$  per cent per annum compound interest.

7. A person invested R $16,500$  in  $3\frac{1}{2}$  per cent Government paper at 96 $\frac{1}{4}$ , and an equal sum in bank shares of the nominal value of R $500$  each. If, when the bank is paying dividend at the rate of R $50$  per share, his annual income from the bank shares exceeds his annual income from the Government paper by R $87.8a.$ , find what he paid for each of his bank shares.

8. A merchant at Madras imports 600 tons of English coal, the price of which at the pit mouth is 12s 6d. per ton. The cost price of carriage and freight to Madras amounts to 16s. 6 $\frac{1}{2}$ d. per ton and the landing charges amount to R $3.5a.4\frac{1}{2}p$ . per ton. If the merchant remits the price of the coal and the cost of carriage and freight to Madras when the exchange is at the rate of 1s  $3\frac{1}{2}\frac{1}{2}d$  per rupee, at what price per maund of 82 $\frac{1}{2}$  lb. avoirdupois must he sell the coal in Madras in order that he may gain R $3255$  on the transaction?

9. In 1896 the working expenses of a certain railway amounted to 50.8 per cent of the gross earnings and the net earnings to 4.41 per cent of the total capital expenditure. In the same year the working expenses of another railway amounted to 54.9 per cent of the gross earnings and the net earnings to 5.25 per cent of the total capital expenditure. If the total capital expenditure on the former railway was 1222.5 lakhs of rupees, and if the gross earnings of the latter were four-fifths of the gross earnings of the former, what was the total capital expenditure on the latter?

10. In a certain year 2.5 per cent. of the articles given out for delivery from post offices in the Presidency of Madras were returned undelivered. Next year there was an increase of 7.5 in the number of articles given out for delivery and an increase of 10.5 per cent. in the number of articles returned undelivered. If in this year the number of such articles was 1957176, find how many articles were given out for delivery in each year.

11. Extract the cube root of 1754.099916 to two places of decimals.

### 1899.

2. Simplify  $\frac{\frac{5}{3} \text{ of } 3\frac{1}{2} - \frac{2}{3} \text{ of } 1\frac{1}{2}}{(\frac{5}{3} + 1\frac{1}{2}) - (\frac{5}{6} - 1\frac{1}{2})} \cdot \frac{11\frac{1}{2} - 7\frac{1}{2}}{5\frac{1}{2} + 7\frac{1}{2}}$ .

3. Divide 0003922130575 by 047729; and find the value of 2.02376 of R $7.14a.3\frac{1}{2}p$ .

4. Find by any method the value of 19 cds. 17 mds. 5 v. 25 pals. of sugar at R $58.5a.4\frac{1}{2}p$  per candy.

5. Find to the nearest pie the amount of R $1750$  for 3 years, reckoning compound interest at  $3\frac{1}{2}$  per cent per annum.

6. A person invested a sum of money in 3 per cent. Government paper at 91 $\frac{1}{4}$ , and when the price rose to 94 $\frac{1}{2}$  he sold out and invested the

amount realised in the 4 per cents. at  $10\frac{1}{2}$ . If from this investment he derives an annual income of Rs 2727. 1a 4p. after paying income tax at the rate of 5 pies in the rupee, find what sum he invested in the 3 per cents.

7. A person A sets out from a place P to walk to a place Q. A quarter of an hour later a second person B sets out from P to walk to Q, but after walking half a mile returns to P, where he is detained 10 minutes. Again setting out from P he reaches Q 5 minutes after A. If A walks throughout at the rate of 3 miles an hour and B at the rate of 4 miles an hour, find the distance between P and Q.

8. In a certain year the total number of passengers carried on a railway was 12976200 and the receipts from the passenger traffic amounted to 45 lakhs of rupees. Of this sum 16 per cent. was contributed by first class passengers, 4 per cent. by second, and the remainder by third. If the fares for first, second and third class passengers were 12 pies, 4 pies and  $1\frac{1}{2}$  pies per mile respectively, while the average distance travelled by each first class passenger was 60 miles, and the average distance travelled by each second class passenger was 40 miles, find what was the average distance travelled by each third class passenger.

9. A coffee merchant in India buys coffee for shipment to England, for which he pays on the average Rs 11 15a. 3p per maund of 25 lb. The process of curing reduces the weight of the coffee 10 per cent. and for carriage, curing and freight the merchant has to pay at the rate of Rs 60 per ton of cured coffee. If the coffee is sold in England at the rate of 92s. 6d. per cwt. and if the amount realised from the sale of it is remitted when exchange is 1s 4d. per rupee, find the merchant's gain per cent. on his outlay.

10. In a certain country the number of males who can read and write exceeds the number of females who can do so by 2459500. If the total female population is to the total male population as 1025 to 1000, and if 15 out of every 100 males and 1 out of every 100 females can read and write, find the total population of the country.

11. Find the edge of a cubical cistern having the same capacity as a rectangular cistern 14 feet 7 inches long, 12 feet 3 inches broad and 3 feet 9 inches deep.

### 1900.

2. Express  $\frac{4\frac{1}{2} - \frac{1}{5} \text{ of } 1\frac{7}{8}}{10\frac{1}{2} + 11\frac{3}{4} + 1\frac{1}{2} \text{ of } 15} \times \frac{9\frac{1}{2} - 3\frac{1}{4}}{1\frac{1}{2} + 2\frac{1}{2}}$  as a simple fraction in its lowest terms.

3. Find the value of '094921875 of Rs 13. 5a. 4p., and express Rs 21. 13a. 9p. as the decimal of a lakh of rupees.

4. Find the cost of repairing a road 27 miles 6 furlongs 196 yards long at Rs 1786. 5a. 8p. per mile.

5. When the price of grain was  $10\frac{1}{2}$  measures per rupee the cost of grain for 6 horses and 12 ponies for 6 weeks was Rs 82 10a. Assuming that the daily allowance for a pony was two-thirds of the daily allowance

for a horse, find what will be the cost of grain for 12 horses and 6 ponies for the months of April, May and June if the price during that period is  $9\frac{1}{2}$  measures per rupee and the daily allowances for a horse and a pony are the same as before.

6. Find the present worth of R545. 11a. 8p due 2 years hence at 4 per cent. per annum compound interest.

7. A sum of money is made up of rupees, half rupees, quarter rupees and two anna pieces. The number of rupees is ten times the number of half rupees, six times the number of quarter rupees and eight times the number of two-anna pieces, and the value of the rupees exceeds the value of all the other coins by R428 8a. What is the sum?

8. A merchant imports sugar at 175 11d. per cwt., the cost of which he remits when exchange is at the rate of 15 4½d. per rupee. Freight and landing charges amount to R37. 8a per ton and import duty at the rate of 8a 8p per cwt. has also to be paid. If the merchant sells the sugar at the rate of R3 14a 6p per maund of 25 lb, find how much he gains per cent. on his total outlay.

9. The capital of a spinning company amounts to 15 lakhs of rupees in shares of R50 each, fully paid up. The gross value of the goods manufactured in a certain year was 31.25 lakhs of rupees and the net profits amounted to 4 per cent. of this. If at the end of the year the sum of half a lakh of rupees was placed in the reserve fund and the remainder of the profits was distributed among the shareholders, find what rate of interest was received by a shareholder who at the beginning of the year bought shares at R62. 8a each.

10. In two successive years the working expenses of a certain railway amounted to 48.25 per cent. and 47.1 per cent. of the gross receipts for these years respectively. If the net receipts for the second of the two years showed an increase of 3.5 per cent. on the net receipts for the first, find what was the rate of increase per cent. in the gross receipts.

11. A rectangular cistern has a capacity of one million gallons. The length of the cistern is twice its breadth and its depth is 7 feet 6 inches. Taking a gallon to be 277.274 cubic inches, find to the nearest inch the length of the cistern.

## 1901.

1. The gross earnings of a certain railway company during the first six months of the year 1899 were as follows : January, R1134267. 13a. 5p. ; February, R1098763 10a. 11p. ; March, R1109835 6a. 9p. ; April, R1148239 2a. 6p. ; May, R1132470 15a. 8p. ; June, R1087493 12a. 7p. Find (1) the gross earnings for these six months, (2) the average daily earnings.

2. Reduce to its simplest form the expression

$$\frac{\frac{3}{5} + \frac{1}{2} \times \left( \frac{4}{5} - \frac{2}{3} \right)}{\frac{2}{5} \text{ of } 1\frac{1}{2} - \frac{3}{5} \text{ of } 1\frac{1}{4}} - \frac{\frac{3}{5} + \frac{1}{2} - \frac{2}{3}}{\frac{1}{5} + \frac{1}{2} - \frac{2}{3}}$$

3. Find the value of '018984375 of R66. 10a. 8p. and multiply '04657 by '934, expressing the result as a decimal.

4. Find by any method the value of 179 cds. 13 mds. 7 v. 33 pals. of salt at R23 5 $\alpha$  4 $\rho$  per candy.

5. During a certain period the yield of a tea estate containing 187 ac. 1 ro 28 po was at the rate of 375 lb per acre per annum, and the average price realised for the tea produced was 7 $\frac{1}{2}$  d. per lb. During the same period the yield of another estate containing 257 ac. 1 ro. 660 sq. yds. was at the rate of 300 lb per acre per annum, and the average price realised was 8 $\frac{3}{4}$  d. per lb. If the value of the tea produced on the former estate during the period in question was R29,452 8 $\alpha$ , and if the average rate of exchange was the same in both cases, what was the value of the tea produced on the latter estate?

6. If the interest on R1368 12 $\alpha$  for 45 days is R5 14 $\alpha$  6 $\rho$ , what is the rate per cent. per annum (365 days)?

7. A person owned house property yielding a rental of R1750 per mensem, of which he had to spend 37 $\frac{1}{2}$  per cent. on repairs, management, taxes, etc. He sold the property, realising R365,750 which he invested in 3 $\frac{1}{2}$  per cent. Government paper at 96 $\frac{1}{2}$ . If he has to pay income-tax at the rate of 5 pies in the rupee on the interest derived from the investment, find the alteration in his clear annual income.

8. A merchant wishing to clear out his old stock sold one lot of goods at a reduction of 12 $\frac{1}{2}$  per cent., another at a reduction of 25 per cent. and a third at a reduction of 50 per cent. on the usual prices. He realised R682 8 $\alpha$ , R1012 8 $\alpha$  and R450 for these lots respectively, and found that on the whole he had a loss of 2 $\frac{1}{2}$  per cent. on the price paid by him for the goods. What would he have lost or gained per cent. if he had sold all the goods at a reduction of 20 per cent. on the usual prices?

9. In a certain year three-eighths of the quantity of wheat raised in a country was exported at R2 6 $\alpha$  per bushel. In the following year the acreage under wheat showed an increase of 12 $\frac{1}{2}$  per cent., but the yield per acre was only five-sixths of what it was in the former year, and of the total amount of wheat raised only one-third was exported. If the value of this at R2 8 $\alpha$  per bushel was 375 lakhs of rupees, find the value of the wheat exported in the first of the two years.

10. A merchant in Madras owing £398 5s 9d. to a merchant in London, finds that by remitting through Paris, instead of direct, he can save R58 8 $\alpha$ . If exchange between Madras and Paris is at the rate of 1.71 francs per rupee and exchange between Paris and London at the rate of 25.2 francs per £1, find the rate of exchange between London and Madras.

11. Extract the square root of 822655 9194245541 to five places of decimals [The remainder must be written down].

## III. UNIVERSITY OF BOMBAY. ENTRANCE PAPERS.

1868.

1. How many yards of matting 2 feet 3 inches wide will be required for a square room whose side is 18 feet 9 inches?
2. What will be the cost of a Bill of Exchange on London for £1364. 14s. 6d. at 1s 10½d. per rupee?
3. Reduce  $\frac{\frac{1}{4}x\frac{1}{3}}{3-\frac{1}{4}} \times (\frac{1}{2} \times \frac{1}{2})$  to its simplest form.
4. What is the difference between  $6\frac{1}{7}$  and  $0\frac{1}{7}$ ?
5. If an ounce of gold be worth £4.18953, what is the value of 103753 lb.?
6. If A owns  $\frac{1}{24}$  of a ship, and B the rest, and the difference in the value of their shares is £28.76, what is the value of the whole ship?
7. What sum must be invested in 5½ per cent. Promissory Notes to produce a monthly income of Rs 350?
8. At what rate per cent. would Rs 7,200 amount to Rs 18,650 in 5 years?
9. There are two schools, one containing 650 boys and the other 340 boys; 5 per cent. of the former are generally absent and 7.5 of the latter; what is the average attendance in each?
10. If 8 per cent be gained by selling 218 yards of cloth for £92. 13s., at what price per yard must it be sold so as to gain 17 per cent.?
11. If 400 men could do a piece of work in 3.4 days, how many men would do  $\frac{1}{2}$  of the same work in 15 days?
12. What is the value of a beam of timber whose length is 30 feet, breadth  $3\frac{1}{2}$  feet, and thickness  $2\frac{1}{4}$  feet, at 3s. 9d. per cubic foot?
13. Find the cube root of .4.

1869.

1. Find the G. C. M. of 2231 and 4656; and the L. C. M. of 4, 9, 16, 28, 42.
2. Add together  $\frac{2}{3}$ ,  $\frac{1}{12}$ ,  $\frac{1}{15}$ ,  $\frac{1}{18}$ ,  $\frac{1}{24}$ .
3. Find the value of:—

$$\frac{1}{3\frac{1}{2}} - \frac{2\frac{1}{2}}{9} + \frac{3\frac{1}{2}}{2} + \frac{4}{4\frac{1}{2}}.$$

4. Convert into vulgar fractions the decimals .015625 and .01190476 and reduce the results to their lowest terms.

5. Reduce Rs. 7 $\frac{1}{2}$ a. to the decimal of Rs. 10.

6. Divide the sum of Rs 3281 12 $\frac{1}{2}$ a. among 4 persons in the proportion of 3, 5, 8, 9

7. If £442 amount to £530. 8s. in 5 years, what is the rate per cent. of simple interest?

8. Find the amount of £1,000 in 6 years, at 5 per cent. compound interest.

9. If 27 men take 15 days to mow 225 acres of grass, how long will 33 men take to mow 165 acres?

10. A person has Rs 100,000 stock in Government 4 per cent. ; he sells out all his stock at 92 $\frac{1}{2}$ , he then re-invests the purchase money in Bank of Bombay Shares of Rs 500 each, at Rs 25, which pay 6 per cent. per annum ; find the alteration in his income

11. Find the square roots of 3129361 and 434.027.

12. Show that the cube root of .037 is .3

## 1870.

1. Write down in figures the following —  
Six hundred and fifty-four thousand three hundred and twenty-three billions, four thousand and twenty-one millions, fifty thousand three hundred and one.

Express in words the number 1327875430029 according to the English and Hindu systems of numeration.

2. Find the value of  $3\frac{1}{2} + 4\frac{1}{4} + 1\frac{1}{3} + 3\frac{1}{7}$ , both by vulgar fractions and decimals, and show that the two results coincide

3. Divide the difference of  $7\frac{1}{3}$  and  $9\frac{1}{6}$  by their sum, multiply the quotient by  $\frac{1}{2}$  of  $7\frac{1}{2}$ .

4. If an ounce of gold be worth £4.0026 ; what is the value of a bar of gold weighing 1.683 lb.?

5. If a family of 9 persons spend Rs 4,800 in 8 months, how much will serve a family (living upon the same scale) of 24 persons for 16 months?

6. Three equal glasses are filled up with mixtures of spirit and water ; the proportion of spirit to water in each glass is as follows : in the first glass as 2 : 3, in the second glass as 3 : 4, and in the third as 4 : 5. The contents of the three glasses are emptied into a single vessel ; what is the proportion of spirit and water in it?

7. What are the weights of a sovereign and a shilling, the pound Troy of standard gold being coined into £46 14s 6d, and the pound of silver into 66 shillings?

8. Find the interest on £215. 12s. for 3 years 8 months and 10 days at 4 $\frac{1}{2}$  per cent. per annum.

9. A ship worth Rs. 9,000 being entirely lost, of which one-fourth belonged to *A*, one-sixth to *B*, and the remainder to *C*; what loss will each sustain, supposing Rs. 5,400 of the ship were insured?

10. Extract the square roots to six places of decimals of .099 and of 3.3.

11. How much stock in the 3 per cents. must I sell to pay off a debt of £50, the price of the stock being 94 $\frac{1}{2}$ , and commission of  $\frac{1}{6}$  on £100 of stock being also taken into consideration?

### 1871.

1. The distance of the sun from the earth is ninety-one millions seven hundred and seventy-six thousand miles, and light travels from the former to the latter in seven minutes and fifty-eight seconds; find the velocity of light per second.

2. Find the G. C. M. of 441441 and 844272 and the L. C. M. of 7, 11, 21, 63, 91, 99, 117, 143.

3. Define a fraction, and prove that the value of a fraction is not altered if we multiply both its numerator and denominator by the same whole number.

Bring  $\left\{ \left( \frac{\frac{5}{4} - \frac{1}{2} \text{ of } 2\frac{2}{3}}{\frac{5}{6} \times 4\frac{1}{3} + 1\frac{1}{2}} + \frac{2\frac{2}{3}}{4\frac{1}{3}} \right) \div 21\frac{2}{3} \times 3\frac{1}{4} \right\}$  cwt. to the fraction of 4 $\frac{1}{4}$  tons.

4. State and prove the rules for reducing terminating and circulating decimals into their equivalent vulgar fractions.

Ex. .03125 and .729.

Find the value of .03125 of Rs. 2 + .729 of Rs. 3 $\frac{1}{4}$  + .729 of Rs. 4 $\frac{5}{8}$ .

5. If 10 horses and 98 sheep can be kept 9 days for £37. 17s. 6d.; what sum will keep 45 horses and 216 sheep for 40 days supposing 5 horses to eat as much as 76 sheep?

6. If the par of exchange be two English shillings for the Indian rupee, but if an Indian bill of exchange for Rs. 540. 12a. be negotiated in London for £51. 10s.; how much per cent. below par is the rate of exchange?

7. Distinguish between interest and discount. The interest on a certain sum of money for three years is Rs. 25, and the discount for the same time is Rs. 45, simple interest being reckoned in both cases. Find the rate per cent. per annum and the sum.

8. A person desires to paper his room with postage stamps; the room is 14 feet 9 inches long, 9 feet 3 inches broad and 10 feet 6 inches high; it contains two windows, each 5 $\frac{1}{2}$  feet by 4 feet and 3 doors each 6 feet by 3 feet; a postage stamp is  $\frac{1}{16}$  inch long and  $\frac{1}{4}$  inch broad. Find the number of postage stamps required to cover the room.

9. A person invests 1,250 gold mohurs in the Government five per cent. rupee stock at 105. The stock is converted subsequently to 4 $\frac{1}{2}$  per cents. at 95. Find the difference in his income, each gold mohur being considered equivalent to Rs. 17.

10. A certain number of persons agree to subscribe as many pies each as there are subscribers ; the whole subscription being Rs. 797. 0a. 1p. How many subscribers were there ?

1873.

1. Simplify.— 
$$\frac{\frac{518}{1871428} - \frac{1}{1873}}{1 + \frac{1}{1873} \times \frac{518}{1871428}}$$

2. Find the value of '375 of a guinea +  $\frac{5}{4}$  of 8s. 3d. + 027 of £2. 15s. and reduce the result to the fraction of a guinea and a half.

3. A man owns  $\frac{1}{5}$  of a ship and sells '3571428 of his share ; what fraction of the ship does he still own ?

4. If the income-tax be 6 pies in the rupee for the first half of the year and 3 per cent in the second, what is the gross income of a gentleman whose net annual receipts amount to Rs. 1,454. 1a ?

5. Five men do '6006 of a piece of work in 2 12 hours ; how long will 6 boys take to finish it, it being known that 3 men and 7 boys have done the whole piece of work in 3 hours ?

6. If the difference between the simple and compound interest of a sum of money for 2 years at 5 per cent. be £5. 18s. 9 $\frac{3}{4}$ d., find the sum.

7. When the three per cents were at 90, I found that by selling out and investing in the 4 per cents. at 95 I could improve my income by Rs. 243. What was the amount of my stock in the three per cent. ?

8. A gardener plants an orchard with 5776 trees and arranges them so that the number of rows of trees equals the number of trees in each row. How many rows were there ?

9. How many seconds will a train 184 feet in length, travelling at the rate of 21 miles an hour, take in passing another train 223 feet long proceeding in the same direction at the rate of 16 miles an hour ?

10. Find the cube root of 1879080904.

1874.

1. Simplify the fraction :—

$$\frac{\frac{3}{4} + \frac{2}{3} + \frac{5}{6} - \frac{1}{2} \text{ of } \frac{5}{12} \text{ of } \frac{5}{4}}{1 - \frac{1}{3} \text{ of } \frac{5}{12} - \frac{1}{12} \text{ of } \frac{5}{4} - \frac{1}{24} \text{ of } \frac{5}{3}}$$

2. Divide 8064 by { 846 +  $\frac{2}{7}$  of 2916 }.

3. A man owns  $\frac{5}{8}$  of a house, and sells '135i of his share ; what fraction of the house does he still own ?

4. In a subscription list one-half of the subscriptions are a guinea each, one-third a half-guinea each, and the 5 shilling subsciptions which complete the list amount to £12 ; find the whole amount subscribed.

5. If the work done by a man, a woman, and a child be in the ratio of 3, 2, 1, and there be in a factory 24 men, 20 women and 16 children,

whose weekly wages amount to R204 ; what will be the yearly wages of 27 men, 40 women and 15 children ?

6. The debts of a bankrupt amount to £2134. 10s. 6d., and his assets consist of property worth £916. 15s. 4d., and an undischarged bill of £513 due 4 months hence, simple interest being reckoned at 4 per cent. How much in the pound can be paid his creditors?

7. A merchant buys 4,000 maunds of rice, one-fifth of which he sells at a gain of five per cent., one-fourth at a gain of ten per cent., one-half at a gain of twelve per cent., and the remainder at a gain of sixteen per cent. If he had sold the whole at a gain of eleven per cent., he would have made R728 more. What was the cost of the rice per maund?

8. The shares in a banking concern are R1000 each, R426. 10 $\frac{1}{2}$ a. are only paid up, and the shares are quoted in the market at R460. The dividend is R7 $\frac{1}{2}$  per share quarterly. A gentleman holds 100 original shares. Find what interest he makes per cent. ; and what he would make and how much per cent. if he sold out and invested in 4 per cent. Government stock at par.

9. *A* and *B* are the termini of a Railway 144 miles long. A fast train starts from *B* at 9 h. 0 m.; another fast train, travelling at the same rate, starts from *A* at 10 h. 0 m. A slow train starts from *B* at 10 h. 20 m.; the fast train from *A* meets the other fast train at 11 h. 30 m., and the slow train at 12 h. 32 m.; find the rates at which the trains travelled.

10. Arrange in order of magnitude :—

$$\sqrt[3]{50}, \sqrt[3]{344}, \sqrt[3]{2402}.$$

1875.

- I. Write out in words the following expressions:—
  - (a) 8271096.
  - (b) 9032804.
  - (c) 319080259417.
  - (d) 8004640.
2. What is the rule for the addition of concrete numbers? Add together 17 miles, 3 furlongs, 19 poles, 28 yards, 2 feet, 10 inches; 4 miles, 3 furlongs, 8 poles, 7 yards, 2 feet and 9 inches.
3. Explain what is meant by the following words and give examples:—  
*Measure, Multiple, Greatest Common Measure, and Least Common Multiple.*
4. How many acres are contained in three countries, of which the first comprises 723100 square miles, the second 12342, and the third 89704 square miles?
5. Divide  $\frac{1}{2}$  of  $\frac{2}{3}$  of  $\frac{5}{7}$  of 42 by the sum of  $2\frac{1}{3}$  and  $4\frac{5}{7}$ .
6. What are *continued fractions*, and when do you make use of them?  
 Find three fractions approximating to  $3\frac{17}{27}$ .
7. Find the product of 17 302 and .579 to three places of decimals, by the rule of contracted Multiplication.
8. What sum will discharge a debt of R7,200 due a year and a half hence at 4 per cent. per annum?

9. Find the square root of 745.29 and the cube root of 32768.

10. Divide a guinea between *A*, *B*, *C*, *D*, so that *B*'s share is  $\frac{1}{2}$  more than *A*'s, *C*'s  $\frac{1}{3}$  more than *B*'s and *D*'s  $\frac{1}{4}$  more than *C*'s.

11. How much stock can be purchased by the transfer of Rs 20000 stock from the 3 per cents. at 90 to 3½ per cents. at 96; and what change will be effected in income by it?

12. Required the number of square feet there are in a piece of slate  $8\frac{1}{2}$  feet  $\frac{1}{2}$  in. in length, and  $1\frac{1}{2}$  feet  $\frac{1}{2}$  in. in width.

1877.

1. Define the arithmetical terms —*notation, numeration, unit, integer, fraction, abstract, concrete*. Can you (1) multiply concrete numbers together? (2) divide a concrete number by a concrete number? Give examples to illustrate the nature of such operations.

2. Two men *A* and *B* start together, and when *A* has gone a mile *B* has gone  $\frac{1}{2}$  of  $1\frac{1}{2}$  of  $\frac{1}{2}\frac{1}{2}$  of  $\frac{2}{3}\frac{1}{2}$  of  $7\frac{1}{2}$  of  $\frac{1}{2}\frac{1}{2}\frac{1}{2}$  of a mile:  $\frac{1}{2}\frac{1}{2}\frac{1}{2}$  of  $1 - \frac{1}{2}\frac{1}{2}$  of  $\frac{1}{2}\frac{1}{2}$  of a mile: which is in advance of the other?

3. Express the difference between 37½ of 13s. 10½d. and 37½ of 16s. 6d. as a fraction of

$$42\frac{5}{8} \text{ of } \frac{3\frac{1}{2}}{08} \text{ of } \frac{3}{735} \text{ of } \frac{147 \times 4\frac{4}{4}}{11 \cdot 1} \text{ of £1. 17s. 6d.}$$

4. A lb. of tea and 3 lb. of sugar cost Rs 3, but if sugar rose 50 per cent. and tea 10 per cent., they would cost Rs 3. 8a.; find the prices per lb. of tea and sugar.

5. The circumferences of the wheels of a carriage are  $6\frac{3}{4}$  feet and  $8\frac{1}{2}$  feet; what is the *least* distance in which both wheels will simultaneously complete an integral number of revolutions? How often will the lowest points of the two wheels at starting touch the ground together in 10 miles?

6. *A*, *B* and *C* rent a field for Rs 2,878. *A* puts in 12 horses for 5 months and 45 sheep for 3 months; *B* puts in 15 oxen for 6 months and 54 sheep for two months; *C* puts in 6 horses and 48 oxen for 3 months. Now, 4 horses and 3 sheep together eat as much as 5 oxen and 1 horse, and 2 oxen eat as much as 7 sheep; how much of the rent should *A*, *B*, *C*, pay respectively?

7. What sum of money will amount to 699. 13s. 2d. in 2 years reckoning compound interest for the first year at 4 per cent. and for the second 3½ per cent. per annum?

8. A person finds that if he invest a certain sum in railway shares paying £6 per share when the £100 share is at £132, he will obtain £10. 16s. a year more for his money than if he invest in 3 per cent. consols at 93. What sum has he to invest?

9. Find the value of  $\sqrt{(.00139876)} - \sqrt{(.000030664297)}$ .

10. A man near the sea-shore sees the flash of a gun fired from a vessel steaming directly towards him, and hears the report in 15". He then walks towards the ship at the rate of 3 miles an hour, and sees a second flash 5 minutes after the first, and immediately stops ; the report follows in 10". Find the rate of the ship, the velocity of the sound being 1,200 feet per second.

### 1878.

1. Seven men find a lump of gold weighing 13 lb.  $7\frac{1}{2}$  oz. Troy, What will be each man's share, supposing gold to be worth £3. 17s.  $10\frac{1}{2}$ d. per ounce ?

2. Simplify :—

$$1\frac{1}{4} - \frac{1 - \frac{1}{2}}{2 - \frac{1}{4}} + \frac{1\frac{2}{3}}{3\frac{1}{2}} - \frac{5\frac{5}{6}}{6\frac{1}{4}} \text{ of } \left\{ \frac{1}{2} - \frac{\frac{1}{2} - \frac{1}{3}}{4\frac{3}{4} - 3\frac{2}{3}} \right\}.$$

3. Find the value of .—

$$38\frac{2}{7} \text{ of } £8. 16s. 3d. + 6\frac{1}{2} \text{ of } \frac{4}{5} \text{ of } 7s. 8\frac{1}{2}d. + \frac{7}{12} \text{ of } 1s.$$

4. What is the length of the edge of a cubical cistern which contains as much as a rectangular one whose edges are 154 ft. 11 in., 70 ft. 7 in. and 53 ft. 1 in. ?

5. In 1861 three towns had populations of 17650, 19600, 18760, respectively. In 1871 the population of the first had decreased 18 per cent., that of the second had increased 21 per cent., while the population of the third had increased by 4690 ; find the change per cent. in the population of the third town.

6. A bankrupt has goods worth R9750 ; and had they realised their full value, his creditors would have received 13a. in the rupee ; but  $\frac{2}{3}$  of them were sold at 17 5 per cent., and the remainder at 23 75 per cent., below their value. What sum did the goods fetch, and what dividend was paid ?

7. What sum will amount to £1,591. 13s. 2 $\frac{1}{2}$ d. in 3 years at compound interest ; the interest for the first, second and third years being 3, 2 and 1 per cent respectively ?

8. Find the true discount on £2,750 due two years hence at  $4\frac{1}{4}$  per cent.

9. If 4 men earn as much in a day as 7 women, and one woman as much as 2 boys, and if 6 men, 10 women and 14 boys working together for 8 days earn £22, what will be the earnings of 8 men and 6 women working together for 10 days ?

10. A person having a certain sum of money to invest, finds that an investment in a railway stock bearing 5 per cent. interest at 117 $\frac{1}{2}$  will yield him £29 more annually than an investment in the 3 per cents. at 92 $\frac{1}{2}$ . How much money has he to invest ?

### 1879-80.

1. Add the following numbers :—Eighty-four thousand three-hundred and one ; nine hundred and thirty-three thousand ; forty-seven millions

six thousand three hundred ; and subtract from the result two millions eighty-one thousand and eighty

2. Explain the terms *measure*, *common measure* and *greatest common measure*, and prove that every common measure of dividend and divisor is a measure of the remainder.

3. Find the value of '45 of £1. 3s. 9d. + 25 $\frac{1}{2}$  of £11. 5s. 6d. + 3125 of £5.

4. Find the value of  $\frac{\frac{7}{8} - \frac{2}{5}}{\frac{3}{12} + \frac{1}{8}} \div \frac{3}{4}$  and also of  $\frac{1}{2} + \frac{2}{3} - \frac{4}{15} + \frac{5}{12}$ .

5. If by selling wine at R6 per gallon I lose 25 per cent., at what price must I sell it to gain 25 per cent. ?

6. A person borrows £130 on the 5th of March, and pays back £132. 10s. 6d. on the 18th October ; find the rate of interest charged.

#### 1880-81.

1. Simplify the following expressions :—

$$2 + \frac{\frac{1}{2}}{\frac{1}{5} + \frac{1}{12}} ; \frac{4 \frac{5}{12} \times 2 \frac{3}{4}}{5 \frac{3}{4} \times 1 \frac{2}{3}} \times 2 \frac{253}{875} ; \text{ and add together the results.}$$

2. Three boys agree to start together and run, until all come together again, round a circular court 15 yards in circumference. One runs at the rate of six, the second seven, and the third eight, miles an hour. In how many seconds will the race end ?

3. If three soldiers or 10 coolies can dig 155 cubic feet of earth in 5 days, how many coolies must be employed to assist 7 soldiers in removing 600 cubic feet of earth so as to get it done in 4 days ?

4. In what time will R2,250 amount to R2,565 at 7 per cent. per annum ?

5. A merchant sells a lakh of rupees out of the four per cents. at 16 discount, and invests the proceeds while exchange is at 2s 1d in the three per cent. consols at 96. What income does he derive therefrom ?

#### 1881-82.

1. If the income-tax be 7d in the pound in the first half of the year, and 3 $\frac{1}{2}$ d in the second, what is the net income of a gentleman whose gross annual receipts are £1,542. 10s. 6d. ?

2. A passenger train going 41 miles an hour, and 431 feet long, overtakes a goods train on a parallel line of rails. The goods train is going 28 miles an hour, and is 713 feet long. How long does the passenger train take in passing the other ?

3. Find the cost of painting the outside of a cubical box whose edge is 3 $\frac{1}{2}$  feet, at 1 $\frac{1}{2}$  shillings per square yard.

4. A person invests R48,000 in the 4 per cents. at 80, and at the end of each year invests the dividend, which becomes due, in the same stock ;

supposing the funds to remain at 80 for 3 years, find his dividend at the end of the third year.

5. Define *discount*. If the discount on Rs. 2,261. 5. 4 due at the end of a year and a half be Rs. 128, what is the rate of interest?

6. Find the square root of  $\frac{.00125}{.18}$  and the cubic root of 423564.751.

### 1882-83.

1. Find the value of £.596875, and reduce 11 poles 4 yards  $4\frac{1}{2}$  inches to the decimal of one mile.

2. A railway passenger counts the telegraph posts on the line as he passes them. If they are 58 yards apart and the train is going 48 miles per hour, how many will he pass per minute?

3. Three men can do as much work as five boys; the wages of three boys are equal to those of two men. A work on which 40 boys and 15 men are employed takes 8 weeks and costs £350; how long would it take if 20 boys 20 men were employed, and how much would it cost?

4. What sum will amount to £5431. 15s.  $11\frac{1}{4}$ d. in 6 years at  $4\frac{1}{4}$  per cent. simple interest?

5. The sides of two squares contain 77 yards 1 foot 9 inches and 7 yards 2 feet 4 inches respectively; find the side of a square whose area is equal to the sum of the areas of the two squares.

### 1883-84.

1. (a) Express in figures:—Sixteen billion, seventy-five million, forty thousand and two.

(b) Simplify the expression—

$$\left( \frac{1\frac{5}{8} - \frac{5}{7}}{1\frac{5}{8} + 1\frac{5}{7}} \right) \div \left( \frac{\frac{5}{8} - \frac{5}{7}}{1\frac{5}{8} + 1\frac{5}{7}} \right).$$

(c) Find the value of 3.75 of 5s. 6d. + 5.05 of £3. 1s. 8d. + 5.07 of 7s. 6d. + 3.135 of £2. 1s. 3d.

2. At the examination of a school  $\frac{1}{4}$  of the children were presented in the 6th standard,  $\frac{1}{3}$  in the 5th standard,  $\frac{1}{5}$  in the 4th,  $\frac{1}{6}$  in the 3rd,  $\frac{1}{7}$  in the 2nd, and the remainder 107 in the 1st standard; how many were presented altogether, and how many in each of the other standards?

3. In a bicycle race of two miles over a circular course of 1 furlong, the winner in his last round overtook the second at a point in his fifteenth round. Their paces were as 159 to 149. At what distance was this point from the winning post?

4. Find the expenses of an excursion, which includes 5782 miles of railway at  $\frac{2}{3}$ d. per mile, 517 miles of carriage at 10 $\frac{1}{2}$ d. per mile, 57 days of hotel keep at 14s. 3d. per day, allowing 5 guineas for extras.

5. Divide 1.04 by .000078125 and prove your result by vulgar fractions. Find the square root of 8658.3025 and the cube root of 753.571.

## 1884-85.

1. Reduce to a vulgar fraction  $\frac{42857}{100000}$ . Divide 301.6 by 416. Find the value of  $\frac{475}{1000}$  of £1 +  $\frac{42}{1000}$  of £2. 17s. 9d.

2. A merchant buys 1260 maunds of corn, one-fifth of which he sells at a gain of 5 per cent, one-third at a gain of 8 per cent, and the remainder at a gain of 12 per cent. If he had sold the whole at a gain of 10 per cent, he would have obtained £22. 13s. more. What was the cost price per maund?

3. A room, 10 ft. 6 in. high, 22 ft. long and 14 ft. broad, is painted up to one-third of the height and the remaining two-thirds papered. The painting is charged at  $7\frac{1}{2}$ d. per square yard, the paper costs 5s. 2d. per square yard, and the work of papering is charged at 2d. per square yard. How much will the whole cost amount to?

4. A person sells out £3850 four per cent stock at 104 and invests the proceeds in another stock at 143. If the dividend on this be  $5\frac{1}{2}$  per cent, what will be the change in his income?

5. What must be the rate of interest in order that the discount on £387. 7s. 7½d. payable at the end of 3 years may be £41. 10s. 1½d.?

## 1885-86.

1. Reduce  $\frac{2\frac{1}{2}-\frac{1}{2}}{2\frac{1}{2}+\frac{1}{2}}$  of 2 guineas +  $\frac{1}{3}$  of  $\frac{9+\frac{1}{2}}{14 \times 3}$  of 4 crowns -  $\frac{83 \text{ of } 1\frac{1}{2}-\frac{1}{2}}{1\frac{1}{2}}$  of £1 to the decimal of 5 half-guineas, and prove that  $\frac{6+5}{11+7}$  is greater than  $\frac{5}{11}$  and less than  $\frac{6}{7}$ .

2. A man contracts to perform a piece of work in 30 days and immediately employs 15 men on it; at the end of 24 days the work is only half done. How many boys should be given to assist them that the contract may be fulfilled, each boy working two-fifths as much as each man?

3. A person buys 80 tons of coal, and after selling them again at 1s. 6d. per sack finds that he has gained £4; had he sold them for 1s. 4d. per sack he would have lost £6. Find the weight of each sack and the cost price per ton.

4. A field of 7 acres is sown with wheat, barley and maize, the areas of the crops being respectively as  $2\frac{1}{2} : 3\frac{1}{2} : 4\frac{1}{2}$ . If the values of an acre of each be also respectively in the same ratios, and an acre of wheat be worth £7, what is the worth of all the crops in the field?

5. If the three per cents. are at  $92\frac{1}{2}$  and the four per cents. at  $123\frac{1}{2}$ , in which should one invest? And how much is one investing when the difference in income is a shilling?

## 1886-87.

1. Explain carefully the meaning of *prime number*, *factor*, *divisor*, *measures*, *multiple*.

Resolve 5005 into its prime factors.

Add together as decimals  $8.1\bar{3}\bar{8}$ ,  $14.6\bar{5}6\bar{5}$ ,  $2050896\bar{3}$ .

2. The circumference of the forewheel of a carriage is  $6\frac{1}{2}$  feet and that of the hindwheel is  $12\frac{5}{8}$  feet. How many feet must the carriage pass over before the wheels shall have made a complete number of revolutions?

3. A vessel is filled with a liquid, 3 parts of which are water and 5 parts syrup. How much of the mixture must be drawn off and replaced with water so that the mixture may be half water and half syrup?

4. (1) The surface of a cube is  $308\cdot16$  square feet. Find the length of its edge.

(ii) Extract the cube root of  $45\ 69\bar{8}$  to four places of decimals.

5. If the price of gold be £3 10s.  $10\frac{1}{2}$ d. an ounce and a cubic inch of gold weigh 10 ounces, what is the price of the gold that would be required to gild a dome whose surface is 5000 square feet, the thickness of the gold gilding being  $0\cdot002$  of an inch?

6. A person invests in 4 per cent. Government paper so as to receive 4 per cent. clear when the income-tax is 5 pies in the rupee. What percentage will be received if the tax be increased to 7 pies in the rupee?

### 1887-88.

1. Simplify  $\frac{.142857 \times .076923 + 2.75 \times 11.25}{.010989}$ .

2. If 9 lb. of rice cost as much as 4 lb. of sugar, and 14 lb. of sugar are worth as much as  $1\frac{1}{2}$  lb. of tea, and 2 lb. of tea are worth 5 lb. of coffee, find the cost of 11 lb. of coffee if  $2\frac{1}{2}$  lb. of rice cost  $6\frac{1}{4}$ d.

3. If R165. 14a.  $1\frac{7}{12}$ d. be the discount of a debt of R2820, simple interest being at the rate of  $3\frac{1}{2}$  per cent., how many months before due was the debt paid?

4. The price of gold is £3. 17s.  $10\frac{1}{2}$ d. per oz.; a composition of gold and silver weighing 18 lb. is worth £637. 7s., but if the proportions of gold and silver were interchanged, it would be worth only £259 1s. Find the proportion of gold and silver in the composition, and the price of silver per oz.

5. By selling 4 dozen mangoes for 13 rupees, it was found that  $\frac{3}{8}$ ths of the outlay was gained; what ought the retail price per mango to have been in order to have gained 60 per cent.?

### 1889-90.

1. Simplify  $\frac{5\frac{1}{2} \text{ of } 2 \text{ of } 2.571428 - 1 \div (1 + .5)}{1 - \frac{5}{14} \text{ of } \left\{ 5 + \frac{1}{2} \text{ of } \frac{.05}{.142857 \text{ of } 1.20} \right\}}$ .

2. A rectangular cistern, whose length is equal to its breadth, is  $5\frac{5}{7}$  feet deep and contains 5 tons of water. If a cubic foot of water weighs 1000 ounces, find the dimensions of the cistern.

3. *A, B and C* can walk at the rate of 3, 4, 5 miles an hour; they start from Poona at 1, 2, 3 o'clock respectively; when *B* catches *A*, *B* sends him back with a message to *C*; when will *C* get the message?

4. If I borrow money at 3 per cent. per annum, interest payable yearly, and lend it immediately at 5 per cent. per annum, interest payable half-yearly (receiving compound interest for the second half-year), and gain thereby at the end of the year R660 ; what was the sum of money which I borrowed ?

5. A person buys tea at 6 annas per seer and also some at 4 annas per seer. In what proportions must he mix them so that by selling the mixture at  $5\frac{1}{2}$  annas per seer he may gain 20 per cent. on each seer sold ?

## 1891-92.

1. Simplify —

$$(i) \frac{\frac{1}{3} \text{ of } \frac{2}{3} + \frac{5}{6} \text{ of } \frac{1}{2}}{5\frac{2}{3} \text{ of } \frac{1}{3} - \frac{2}{3} \frac{5}{6} \text{ of } \frac{1}{2}}$$

$$(ii) \frac{3.642857i - (0.009923 + 0.0102 - 0.000123)}{\sqrt{34.5744 - \sqrt[3]{9.663597}}} \cdot \frac{145}{0056}$$

2. Two passengers have together 5 cwt of luggage and are charged for the excess above the weights allowed 5s. 2d. and 9s. 10d. respectively, but if the luggage had all belonged to one of them he would have been charged 19s. 2d. How much luggage is each passenger allowed to carry free of charge, and how much luggage had each passenger ?

3. Two clocks *A* and *B*, whose rates are uniform, at noon yesterday indicated 11 hrs 55 min. A M and 0 hr 2 m P. M. respectively. *A* indicated the correct time at 9 P. M. yesterday and *B* at 6 A. M. this morning. When did *A* and *B* last agree and what time did they then indicate ?

4. A person borrows two equal sums of money at the same time at 5 per cent. and  $3\frac{1}{2}$  per cent. simple interest respectively, and finds that if he repays the former sum with interest on a certain date a year before the latter, he will have to pay in each case the same amount, *viz.*, R736. Find the amounts borrowed.

## 1892-93.

1. What decimal of a rupee is '964 pie ? Find the value of '97625 rupee.

$$\text{Simplify } \frac{\frac{5}{8} - \frac{5}{7} \text{ of } \frac{1}{7}}{\frac{5}{8} + \frac{5}{7} \text{ of } 3\frac{1}{2} - \left( \frac{5}{7} \text{ of } \frac{5}{7} - \frac{5}{7} \right)} \div \frac{\frac{1}{2} \text{ of } \frac{1}{2} + \frac{5}{6} \text{ of } 5}{9\frac{1}{2} - 1\frac{1}{2}}$$

2. How long will two examiners, working 8 hours a day, take to look over the answers to this paper, if four examiners, working 5 hours a day, can do it in 8 days ?

3. On a river, *B* is intermediate to and equidistant from *A* and *C* ; a boat can go from *A* to *B*, and back, in 5 hours 15 minutes, and from *A* to *C* in 7 hours ; how long would it take to go from *C* to *A* ?

4. What income will a retired officer obtain in England, from one lakh of rupees, Indian Government  $4\frac{1}{2}$  per cent. bonds, when for drawing and remitting it, his agents in India charge him 3 per cent., and exchange is at 1s.  $2\frac{1}{2}$ d. for the rupee ?

5. Three equal glasses are filled with a mixture of spirits and water, the proportion of spirits to water in each glass being as follows : In the first glass as 2 : 3, in the second 3 : 4, and in the third 4 : 5. The contents of the three glasses are poured into a single vessel ; what is the proportion of spirits to water in it ?

## 1893-94.

(*Set in the Moffussil*).

1. Divide each of the numbers 2,572,125 and 4,061,250 by 125 ; and express as a decimal the first quotient divided by the second.

2. Find, by Practice, the value of 5 yd. 22 $\frac{1}{2}$  in. at £2. 1s. 2d. a yard.

3. If the carriage of 2 cwt. 1 qr. and 18 lb. of goods, for 56 miles, be £1. 1s., what weight can be carried at the same rate, 200 miles for £4. 3s. 4d.

4. A man invests £3,000 in the 5 per cents. If after deducting an income-tax of 8d. in the pound, the man's clear income is £174, what is the price of the 5 per cents. ?

5. A cistern is filled by two taps *A* and *B* in 4 hours and 6 hours respectively, and is emptied by a waste pipe *C* in 3 hours. When the cistern is half full, *A* and *B* are closed, and *C* is opened ; after one hour, *B* is turned on ; and after half an hour more, *A* is turned on. In what time after *C* is first opened, does the cistern become full ?

6. A person buys two kinds of tea, at 5s. a lb. and 6s. a lb., respectively ; and after mixing them he sells the mixture at 6s. 6d. a lb., thereby gaining 17 per cent. In what proportion does he mix them ?

## 1893-94.

(*Set in Bombay*).

1. Reduce to their simplest forms :—

$$(1) \frac{\frac{1}{2} + \frac{1}{3} - \frac{1}{4}}{\frac{2}{3} \text{ of } \frac{4}{5} \text{ of } \frac{5}{6}} ; \quad (u) \frac{2}{3 + \frac{4}{5 - \frac{5}{4}}}.$$

2. Find, by Practice, the value of 9 cwt. 3 qr. 24 lb. at £3. 5s. 8d. per cwt.

3. If 40 men, 60 women or 80 children can do a work in 6 months, in what time will 10 men, 10 women and 10 children do one-third of the work ?

4. A person invested £1,000 in the 3 per cents. at 90 $\frac{1}{2}$  ; but the price rising to 91 $\frac{1}{2}$ , he sold out, and invested the proceeds in the 3 $\frac{1}{2}$  per cents. at 97 $\frac{1}{2}$  ; find the increase in his income.

5. A cistern can be filled by two pipes, *A* and *B*, in 12 minutes and 14 minutes respectively, and can be emptied by a third, *C*, in 8 minutes. If all the taps be turned on at the same moment, what part of the cistern will remain unfilled at the end of 7 minutes ?

6. Two clocks point to 2 o'clock at the same instant on the afternoon of 25th April ; one loses 7 seconds, and the other gains 8 seconds, in 24 hours ; when will one be half an hour before the other, and what time will each clock then shew ?

## 1894-95.

1. When the number representing the year is a multiple of four, it is a leap year, consisting of 366 days, except when this number is a multiple of 100, in which case it is an ordinary year, consisting of 365 days, but when the number is a multiple of 400, it is again a leap year ; on this supposition, calculate the number of days from the first January 1495 to 31st December 1894, both days inclusive

2. A school of boys and girls consists of 453 children ; the number representing the boys is  $\frac{5}{2}$  of the number of the girls. How many boys were there ?

3. Two-thirds of a certain number of poor persons received 1s. 6d. each, and the rest 2s. 6d. each ; the whole sum spent being £2 15s., how many poor persons were there ?

4. If 3 men and 5 women do a piece of work in 8 days, which 2 men and 7 children can do in 12 days, find how long 13 men, 14 children and 15 women will take to do it.

5. A sells a house to B for R4860, thereby losing 19 per cent. ; B sells it to C at a price which would have given A 17 per cent. profit. Find B's gain

6. The compound interest on one rupee is one quarter of a rupee at the end of three years, find the rate per cent. per annum, correct to two places of decimals ; and calculate exactly the compound interest at the end of 9 years.

## 1895-96.

1. When a fraction is reduced to its lowest terms, find the form of the denominator so that the fraction may be expressed as a non-recurring decimal

• Reduce  $\frac{1}{17}$  to decimals

2. A field can be reaped by 10 women in 4 days, or by 6 boys in 10 days, or by 2 men in 12 days. One man, three boys and three women are employed. What is the total expense, if the wages of a man, a woman and a boy are 8a, 5a and 3a. respectively ?

3. The total fare for a journey of 504 miles, partly by main line and partly by branch line, was R17 11a 6p, the rates per mile being 6p on the main line and 8p on the branch line. What distance was travelled on the branch line ?

4. A certain sum amounts to 186 rupees 9 annas and 5 $\frac{15}{16}$  pies in three years at compound interest, and the amount at the end of the third year is to that at the end of the fourth year as 1 : 1 142857. Find the original sum and the rate of interest.

5. A person sells £1600 Russian stock at 75*g*, and invests the proceeds in railway stock at 120. The brokerage for selling Russian stocks is  $\frac{1}{4}$  per cent. stock, and the expenses of buying railway stock are one per cent. on the actual value. What amount of stock did he buy?

## 1896-97.

1. When a vulgar fraction in its lowest terms is reduced to a decimal, whether recurring or non-recurring, prove that the number of decimal places in the period is never greater than the number representing the denominator diminished by one.

Simplify  $1 \frac{699}{1000} \times 2.729$ ; and prove that

$$\frac{5}{9} - 3 \times \frac{5}{19} + 3 \times \frac{5}{29} - \frac{5}{39} = \frac{5 \times 10 \times 20 \times 30}{9 \times 19 \times 29 \times 39}.$$

2. Divide £12,540 among *A*, *B* and *C*, so that *A* shall receive  $\frac{2}{3}$  as much as *B* and *C* together, and *B* shall receive  $\frac{2}{3}$  of what *A* receives.

3. Two railway trains on adjacent parallel lines are running in opposite directions, one at the rate of 40 miles and the other of 30 miles an hour. Each has an engine and tender, and the first train has 12 carriages and the second 17. If the length of an engine and tender be 41 feet, the length of a carriage 32 feet, and the coupling spaces be each 5 feet, how much time will elapse from the moment that the engines meet till the last carriage of the trains have passed each other?

4. Distinguish clearly between *true* and *false* discount.

A banker's discount calculated for one year is 26 times his gain thereby. Find the rate per cent. of interest.

5. A person purchases R10,000 stock partly in the 4 per cents. at 108 and partly in the  $3\frac{1}{2}$  per cents. at 104. He sells the former at 106 and the latter at  $106\frac{1}{2}$ , and loses R35 by the transaction. How much stock did he buy in the 4 per cents.?

## 1897-98.

1. Define *numerator* and *denominator* of a fraction, and prove that by multiplying these by the same number, the value of the fraction is not altered.

Simplify  $1 \div [1 + 1 \div \{1 + 1 \div (1 + 1 \div 2)\}]$ ; and show that

$$\frac{\frac{5}{12} + \frac{1}{99} - \frac{1}{70} + \frac{5}{12} \times \frac{1}{99} \times \frac{1}{70}}{1 - \frac{5}{12} \times \frac{1}{99} + \frac{5}{12} \times \frac{1}{70} + \frac{1}{99} \times \frac{1}{70}} = \frac{7}{17}.$$

2. What is *inverse proportion*? Give two illustrations of it.

A contractor undertakes to dig a canal 12 miles long in 350 days, and employs 45 men; he finds that in 200 days he has completed  $4\frac{1}{2}$  miles. How many additional men must he employ to get the undertaking finished in time?

3. Guns are fired at intervals of 10 seconds in a town towards which a passenger train is approaching at the rate of 30 miles per hour. If sound travels 1144 feet per second, find at what intervals the reports will be heard by the passengers.

4. A sum of Rs 85 put out to compound interest for 3 years produces Rs 97. Find the rate per cent of interest.

5. I invest a certain sum in the 3½ per cents. at 91, and £4000 sterling in the 3 per cents at 75; after paying an income-tax of 7d in the £, my net income is £524. 5s. What sum have I invested in the 3½ per cents?

### 1899-1900.

1. Explain the terms *composite number* and *common multiple*.

(a) Find the least number which must be added to seven thousand and one million nine hundred and seven thousand and sixty-one, in order that the sum may be a multiple of seven hundred and nine thousand four hundred and eighty.

(b) Find the Least Common Multiple of 1160, 2948, 3886.

2. If in France the railway fare for a distance of 384 kilometres is 25·28 francs, how does this rate of charge compare with the English Parliamentary rate of 1d. per mile? Given one metre = 1 yard 3½ inches, £1 = 25·2 francs.

3. A walks to a place at the rate of 4½ miles per hour; at 8 miles from his destination he meets B, and turns back with him (walking at B's rate) for a mile. If A is half an hour late at his destination, what is B's rate? And at what rate should A have walked after parting with B, so as to arrive at the proper time?

4. A trader's debts amount to £5174. 15s.; he has assets sufficient to pay his creditors 16s. 6d. in the pound. Some creditors, however, have the right to be paid in full, and in consequence the others receive only 15s. in the pound. Find how much is paid in full.

5. A man has an income of £415 derived from capital invested in 4 per cent stock; he sells out his stock at 102, and re-invests the proceeds in 5 per cent stock. What price must be paid for the latter, if his new income is £425?

### 1900-1901.

1. (a) Prove that the Least Common Multiple of two numbers is equal to their product divided by their Greatest Common Measure. Find whether the rule is true for three numbers.

(b) A company of soldiers is formed into 6 equal rows, after a time it is re-arranged into 7 equal rows, and finally into 8 equal rows. Find the least number of soldiers above 900 which the company may contain.

2. Reduce the weight of  $\frac{3445 \times 3445 - 1554 \times 1554}{41 \times 405}$

cubic feet of water to the decimal of a ton; it being known that one cubic foot of water weighs 62·37 lb avoirdupois.

3. If 38 men working 6 hours a day do a piece of work in 12 days, find in what time 57 men working 8 hours a day can do a piece of work twice as great, supposing 2 men of the first set to do as much work in 1 hour as 3 men of the second set can do in  $1\frac{1}{2}$  hours.

4. A person invested R15,147 in 4 per cent. stock, and R12,954 in 6 per cent. stock. When the stocks were at R86 1 $\frac{1}{4}$  and R102 respectively, what income did he derive from these investments? He afterwards transferred at the above rates a certain sum of money from the 6 per cent. stock to the 4 per cent. stock and then found that the income from each stock was the same. How much stock had he finally in the 6 per cents.?

5. (a) Find the square root of .0001083681.

(b) A stone dropped down a shaft falls through a number of feet equal to 16 1 times the square of the number of seconds during which it is falling. Find to two places of decimals the number of seconds that the stone will take to reach the bottom of a mine 1104 yards deep.

#### IV. THE PUNJAB UNIVERSITY. ENTRANCE PAPERS.

1875.

1. Write in figures one million, ten thousand and one. Subtract 397 from 1,163 and explain the process.

2. Shew that when any number is divided by nine the remainder is the same as when the sum of the digits is divided by nine.

3. State the rules for the multiplication and division of vulgar fraction. What is a complex fraction? and simplify

$$(1) \left\{ \frac{5}{17} + \frac{3}{5} \text{ of } 7\frac{1}{2} \right\} \div \frac{13}{17}, \text{ and } (2) \frac{\frac{5}{3}}{\frac{5}{9}} + \frac{\frac{5}{5}}{\frac{5}{9} + 7\frac{1}{2}}$$

4. What is the value of .3375 of an acre?

Reduce £1. 10s. 4d to the decimal of two guineas.

5. Find the square root of 9,98,001 and that of 3.14159 to three places of decimals.

6. If five pumps each having a length of stroke of 3 feet, working 15 hours a day for 5 days, empty the water out of a mine; how many pumps with a length of stroke of  $2\frac{1}{2}$  feet, working 10 hours a day for 12 days, will be required to empty the same mine; the strokes of the former pumps being performed four times as fast as those of the other?

1876.

1. How many revolutions will a cart wheel of three feet six inches diameter make in going a distance of 6 miles, the ratio of the diameter of a circle to its circumference being given as 1 : 3.14159?

2. A piece of land measuring 48 ghumas 3 kanals and 17 marlas of which 39 ghumas 4 kanals and 17 marlas are cultivated and the rest

uncultivated is sold at the rate of R75/- a ghuma for cultivated and R35/- a ghuma for uncultivated land. What is the price of the whole ?

3. The revenue of a village containing 15,756 acres of cultivated land is assessed at 13 annas an acre. What will the local rate of  $6\frac{1}{2}$  per cent. on the land revenue payable by the village amount to ?

4. A bani purchases 1,526 maunds of grain at 36 seers for a rupee. He sells one half at 26 seers the rupee ; at what rate must he sell the remainder so as to clear 50 per cent. on the transaction ?

5. Find the interest on 24,485 rupees for 1 year and 131 days at 12 per cent. per annum.

6. A man hires a workman on this condition that for every day he worked he should get one rupee but that for every day he was absent he should be fined 12 annas. When 356 days were past the workman was to receive R118. How many days had he worked ?

### 1877.

1. If a pound of pure silver be worth 62 shillings, the shilling containing 222 parts of pure silver in 240, what will be the value in shillings of a rupee weighing 180 grains, the rupee containing 979 parts of pure silver in 1,000 ?

2. (a) How much is .0125 of a day ?

(b) Find the value of  $3\frac{1}{2} + 4\frac{1}{3} + 1\frac{1}{4} + 3\frac{1}{15}$ .

Express the result both as vulgar and decimal fraction.

3. Divide .10724 by .003125 and extract the square root of the result to 3 places.

4. (a) What sum at simple interest will amount to R6,000 in 6 years at 4 per cent. per annum ?

(b) How much Government paper of the six per cent. can be bought for R500 when the funds are at 94 and what dividend will be got on it yearly.

### 1878.

1. If 135 rupees 4 annas be divided equally amongst 24 persons what will each receive ?

2. Define a vulgar fraction. By how much does the difference of  $1\frac{1}{7}$  and  $1\frac{1}{5}$  fall short of their sum ? Express the defect as a decimal of 7.

3. (a) Subtract .03 from .03 and divide the result by .102.

(b) Shew that  $\frac{1}{7 + \frac{1}{7}} = .14159$  nearly.

4. A room whose height is 11 feet and length twice its breadth takes 143 yards of paper 2 feet wide for its four walls ; how much carpet will it require ?

5. At what rate (simple interest) will 1,300 rupees amount to 1,381 rupees 4 annas in 15 months ?

6. Find the square root of '1 to 3 places of decimal. What number has '01 for its square root?

## 1879.

1. (a) Show by an example that if the numerator and denominator of a fraction be divided by the same number, the value of the fraction is not altered. (b) Reduce to their lowest terms  $\frac{595}{707}$  and  $\frac{1547}{5713}$  and express their difference in decimal form.

2. Simplify  $\frac{\frac{1}{2} + \frac{1}{3}}{\frac{2}{3} + \frac{2}{11}} \div \frac{\frac{1}{3} + \frac{1}{2}}{\frac{1}{2} + \frac{1}{3}}$ .

3. One cubic inch of water weighs 253.17 grains while one cubic inch of air .31 grains; find the number of cubic inches of water (to three places of decimals) that would be equivalent to one cubic foot of air.

4. (a) What portion of R34. 8a. is  $\frac{3}{12}$  of  $\frac{5}{6}$  of R50 -  $\frac{1}{15}$  of R10  $\frac{1}{2}$ ? (b) Find (accurately to 4 places of decimals) the square root of '001.

5. A rectangular field measures 6 acres and 960 yards; its length is 3 times its breadth; find the distance between the diagonal angles

## 1881.

1. Distinguish between a vulgar fraction and a decimal fraction and show how to reduce one to the other.

2. Divide the continued product of '021, '0021 and 210 by that of  $1\frac{1}{4}$  and '007; and extract the square root of 5.005 to four places of decimals.

3. Express  $\frac{\frac{5}{6} \text{ of } 1\frac{5}{6}}{2\frac{7}{12} + \frac{2}{3} \text{ of } \frac{3}{4}}$  of a rupee to the decimal of a guinea (=R10  $\frac{1}{2}$ ).

4. A person withdrew R5,000 from a bank, which paid him interest at  $5\frac{1}{2}$  per cent. and invested the money in the 6 per cent. Municipal Debenture at  $103\frac{1}{2}$ . Find the change in his income.

## 1883.

1. (a) Divide the difference of '4607 and '00809 by the difference of  $6\frac{5}{8}$  and  $5\frac{25}{28}$ .

(b) Prove that  $\frac{3+4}{4+5}$  is greater than  $\frac{2}{3}$  and less than  $\frac{4}{5}$ .

2. Divide  $\frac{1}{2}[3 + \frac{1}{2}\{3 + \frac{1}{2}(3 + 1\frac{1}{2})\}]$  by '125.

3. (a) Shew that the value of a decimal is not altered by adding ciphers to the right hand side.

(b) Find the value of  $7\frac{5}{7} \times 3\frac{1}{6} - 2\frac{3}{4}\frac{5}{5}$  in vulgar fraction.

4. A railway train having travelled at  $\frac{2}{3}$  of its proper speed reaches its journey's end  $2\frac{1}{2}$  hours behind time; in what time should the journey have been done?

5. Five hundred boys are distributed in three houses ; the smallest house contains  $\frac{7}{15}$  of the whole number and the largest contains  $\frac{11}{12}$  of the smallest ; what is the number in each ?

6. A person realises Rs 185500 by selling his 3½ per cent. stock at 92½. He invests one-fifth of the realised money in the 4 per cents at 96 and the remainder in 3 per cents. at 90. What is the difference in his income by this transaction ?

### 1884.

1. Multiply and divide Rs 625 by Rs 25, if you think the operations possible. Give your reasons

2. State and explain the rules for multiplying and dividing one decimal number by another ; exemplify by multiplying .0256 by 1.05 and 105 successively, and dividing the results by .00105.

3. Simplify  $\frac{4}{7.5} \left\{ \frac{\frac{3}{4} + \frac{75}{45}}{\frac{1 - 25}{2 - 5}} + \frac{7}{8} \right\}.$

4. Extract the square root of  $\frac{1000 \ 20001}{1000}$ .

5. Find, by Practice, the value of 45 md. 22 sr. and 10 ch. of grain at Rs. 6a. per maund.

6. The assets of a bankrupt consist of Rs 9560 4a., a bankshare of Rs 1200 quoted at 107½, and an undischarged bill of Rs 3225, due 4 months hence at 4 per cent per annum simple interest ; his liabilities amount to Rs 25014. How much in the rupee can he pay his creditors ?

7. Compare the ratios  $\frac{\sqrt{5}}{\sqrt{3}}$  and  $\frac{31}{27}$ .

### 1885.

1. Simplify  $\frac{\frac{3}{4} - \frac{1}{2} - \frac{2}{3}}{\frac{3}{4} + \frac{1}{2}} + \frac{\frac{2}{3} + \frac{1}{12}}{\frac{3}{4} - \frac{1}{2}}$  of  $\frac{16}{15} - \frac{11}{12}$ , and find how many times .027 can be taken from 3.33

2. Convert  $\frac{13}{20 \times 8}$  into a decimal ; why is the result a terminating and not a recurring decimal ? Subtract .03 from .03 and divide the result by .007.

3. Find, by Practice, the value of 12 maunds 8 seers 4 chataks of ghee at Rs 2. 8a. per maund.

4. A legacy of £1901. 5s. is to be distributed amongst a number of persons, in such a way that each shall receive as many shillings as there are persons, what will be the portion of each ?

5. Find the Least Common Multiple of 35280 and 592704. What is the smallest number of square yards which can be measured either by rods or square chains ?

6. Four per cents. are offered at R98, five per cents. at R120 $\frac{2}{3}$ ; which is the better investment? How much is one investment when the difference of income is R30?

## 1886.

1. Simplify  $\frac{4\ 4-2\ 8\frac{1}{3}}{1\ 6+2\ 62\bar{9}}$  and extract the square root of the result to three places of decimals.

2. Reduce  $\frac{5}{7-\frac{1}{2-\frac{1}{2}}}$  to a decimal fraction correct to four places.

Is there anything to suggest that the result will be terminating or recurring decimal?

3. What fraction of £51,120. 18s. is 17.975 of £71. 2s.

4. A clever housekeeper went out shopping and found that 2 cocoanuts were selling for the same price as 144 plums; she bought half a dozen cocoanuts, exchanged one of them for 5 melons, and a couple of melons for 5 oranges; she then gave 3 oranges for 42 limes, and finally secured a couple of plums for 5 limes. Has she gained or lost in buying the plums?

5. Distinguish between Interest and Discount.

Find the Interest and Discount of R1,450. 8s. for 3 years at 4 $\frac{1}{2}$  per cent. per annum, simple interest.

## 1887.

1. (a) Write in figures—three billions, five millions, four hundred and nine thousand and sixty-two.

(b) Write out measures of length and surface, both English and Indian.

(c) Express an acre as the decimal of a *bigha*, a cubit being equivalent to 18 inches.

2. Owing  $\frac{4}{17}$  of an estate I sold  $\frac{3}{11}$  of  $\frac{2}{3}$  of my share for £ $\frac{400}{33}$ ; what is the value of  $\frac{12}{41}$  of  $\frac{2}{3}$  of the estate at the same rate?

3. A merchant having 100 maunds of grain sold 50 maunds at R9 per maund, and thereby gained 7 $\frac{1}{2}$  per cent. At what rate should he sell the remainder 50 that he may gain 10 per cent. on the whole?

4. A merchant in trade successively admits three partners at the end of 3 months, 5 months, and 6 months respectively from the opening of the business. The capitals embarked by them were R400, R450, R480 and R495 respectively. After 6 months more, the profit was found to be R1,000. Divide this rateably between the partners.

5. What sum of money invested in the 4 per cents. at par would realise the same income as R10,000 invested in the 4 $\frac{1}{2}$  per cents. at 102?

6. Extract the square root of—

$$\frac{.0025 + 1.6}{3.6 - 2.5} \text{ of } \frac{.426 + 2.625}{12.7 - 10.2}.$$

1888.

1. Simplify—

$$\frac{1}{1 - \frac{1}{12}} - \frac{1 - \frac{1}{12}}{2 - \frac{1}{2}} + \frac{1^2}{4 - 1^2} - \frac{6^2 - \frac{3}{4}}{6^2} \times \left\{ \frac{1}{5} - \frac{\frac{1}{4} - \frac{1}{2}}{4^2 - 3^2} \right\}.$$

2. Express the difference between  $\frac{3}{7} \text{ of } 13s. 10\frac{1}{2}d.$  and  $\frac{3}{7} \text{ of } 16s. 6d.$  as a decimal of  $\frac{3}{8} \times \frac{3}{735} \times \frac{147 \times 44}{111}$  of £1. 17s. 6d.

3. Four men working together all day, can finish a piece of work in 11 days, but one of them having other engagements can work only half time, and another only quarter time. How long will it take the men to complete the work?

4. A merchant sells his goods worth Rs 500 directly for Rs 600 giving three months' credit. Find his profit per cent., interest being calculated at 12 per cent. per annum.

5. Find the value of  $\frac{12 + \sqrt{.009}}{1 - \sqrt[4]{4}}$  correct to three places of decimals.

1889.

1. Express 80080080.0975 in words and give the local value of the digits. What decimal of Rs 75 is Rs 24. 2a. 6p.?

What is the least number which when divided by 22, by 88, by 132 and by 198 gives in each case remainder 7?

2. Why is the fraction  $\frac{5}{8}$  objectionable?

After walking  $4\frac{1}{2}$  miles, a man has accomplished

$2\frac{1}{2} - 1\frac{1}{2}$  of  $2\frac{1}{2} + 1\frac{1}{2}$  of  $\frac{2x + \frac{1}{2}}{7 - \frac{3}{11}}$  of his journey, how far has he still to walk?  
 $(2\frac{1}{2} - 1\frac{1}{2})$  of  $(2\frac{1}{2} + 1\frac{1}{2})$

3. Add together  $\frac{5}{152}$  and  $\frac{.0112}{74}$ .

Five bells which commence tolling together, toll at intervals of 1 $\frac{1}{2}$ , 1 $\frac{1}{5}$ , 1 $\frac{1}{75}$ , 1 $\frac{1}{8}$ , 2 $\frac{1}{1}$  seconds respectively; after what interval will they again toll together?

4. Define "present worth"

A farmer buys 57 sheep for Rs 120, payable at the end of 12 months and sells them directly at Rs 12a ready money; what does he lose by the transaction, supposing the interest of money to be 5 per cent.?

5. Show which is greater  $\sqrt{2}$  or  $\sqrt[4]{3}$ .

Which is the better investment, 3 per cents. at  $83\frac{1}{2}$  or  $3\frac{1}{2}$  per cents. at 3 per cent. discount?

## 1890.

I. Simplify (a) 
$$\frac{\frac{2}{5} + \frac{1}{3} + \frac{1}{7}}{1 - \frac{1}{35} \left( \frac{\frac{2}{5} + \frac{1}{3}}{3} \right)}$$

(b) 
$$\frac{.47 - (.5 - .0303)}{.0873 - (.0083 + .05)}$$

2. What part of  $\frac{2}{5}$  of 5 cwt. is  $\frac{1}{100}$  of a ton?

Express  $3\frac{7}{8}$  of 16s. 6d. as a decimal of 12d. of £1. 17s. 6d.

3. A man bequeathed  $\frac{1}{2}$  of his property to one son, 30 per cent. of the remainder to another, and the surplus to his widow. The difference of his son's legacies was £784. How much did the widow receive?

4. A ship with 1200 men on board had sufficient provisions to last 17 weeks. The survivors of a wreck having been taken aboard, the provisions were consumed in 15 days. How many men were taken aboard?

5. At what price must a person invest in the 4 per cent. Government Promissory Note, so that after paying income-tax at the rate of 5 pies in the rupee, he may receive  $4\frac{1}{2}$  per cent. on his investment?

6. A and B travel together 120 miles by rail. A takes a return ticket for which he has to pay one fare and a half. Coming back they find that A has travelled cheaper than B by 4s. 2d. for every 100 miles. Find the fare per mile.

## 1891.

I. Simplify:—

(1) 
$$\frac{\frac{1}{7} + \frac{1}{3} + \frac{2}{5}}{1 - \frac{1}{35} \left( \frac{\frac{1}{7} + \frac{2}{5}}{3} \right)}$$

(2) 
$$\frac{3\sqrt{2} - 2\sqrt{3} + \sqrt{12}}{3\sqrt{2} + 2\sqrt{3} \sqrt{3} - \sqrt{2}}$$

2. Express 7 7 oz. + 075 cwt. as decimal of 2.25 of a ton.

3. A sum of money invested at 5 per cent. per annum simple interest amounts in 6 years to ₹1326; in what time will it amount to ₹1530?

4. What is discount? Distinguish between true and commercial discount.

The interest on a certain sum at 5 per cent. per annum for a certain time is £50, and the discount at the same rate for the same time is £40. Find the sum and the time.

5. Nine gallons are drawn from a cask full of wine, it is then filled with water. Nine gallons of the mixture are drawn, and the cask is again filled with water. The quantity of wine, now left in the cask is to that of the water in it as 16 : 9. How much does the cask hold?

## 1892.

1. Find by how much the square root of  $9 + \frac{1}{\frac{1}{7 + \frac{1}{2}}}$  differs from  $\frac{44}{11}$ .

Which of these comes nearest to  $3 + \frac{1}{15} \sqrt{2}$ ?

2. Find the value of

$$\left( \frac{0019}{316} \text{ of } \frac{4 \cdot 4}{0005} \right) \div \left( \frac{8 \cdot 8}{7} \text{ of } \frac{4}{5 \cdot 625} \right).$$

3. A stream which flows at a uniform rate of  $1 \cdot 109$  miles an hour, is 20 yards wide, the depth at a certain ferry being 6 feet; how many gallons pass the ferry in a minute? (Each gallon contains about  $277\frac{1}{2}$  cubic inches).

4. A person invests £14970 in the purchase of 3 per cents. at 90 and  $3\frac{1}{2}$  per cents. at 97. His total income being £500, how much of each stock did he buy?

5. A spirit merchant buys 80 gallons of whisky at 18s. per gallon, and 180 gallons more at 15s. per gallon, and mixes them. At what price must he sell the mixture to gain  $8\frac{1}{2}$  per cent. upon his outlay?

## 1893.

1. Add —	R	As.	P.
3436	12	2	
5242	10	3	
248	6	9	
431	13	5	
5302	11	4 $\frac{1}{2}$	
6789	8	1 $\frac{1}{2}$	
5001	15	6 $\frac{1}{2}$	
136854	7	2	
298	9	4 $\frac{1}{2}$	
836993	1	9 $\frac{1}{2}$	

2. Multiply 319 9657 by .04286.

3. Find the value of  $\frac{\sqrt{2} - \sqrt{2}}{\sqrt{2} + \sqrt{2}}$  correct to 5 places of decimals.

4. Calculate the income-tax on Rs666. 10 annas 8 pies at 5 pies per rupee.

5. A local train which travels at the rate of twenty-four miles an hour, leaves Lahore at twenty minutes past eight and reaches Amritsar at five minutes past ten the same morning. It stops at Mianmir for ten minutes and at each of three other stations for five minutes. Find the distance between Lahore and Amritsar.

## 1894.

1. Convert  $\frac{1}{7}$  and  $\frac{2}{7}$  into circulating decimals and point out the relation between the figures in their periods.

2. The sides of a rectangle are as  $3 : 4$  and the area is 1452 square feet. Find its length and breadth

3. Exchange Rs 80 for English money at 1s  $3\frac{3}{4}d$  per rupee.

4. What is discount? How is it commonly calculated? If a sum of Rs 1,000 becomes due three months hence, what is its present value as commonly calculated, and what as correctly calculated, interest being reckoned at 5 per cent.?

5. Find the square root of 101 correct to five places of decimals.

## 1895.

1. Divide  $\frac{48\frac{4}{7}}{1085\frac{1}{7}}$  by  $\frac{7\frac{3}{7}}{174\frac{3}{7}}$ , and reduce the quotient to a recurring decimal.

2. The Imperial gallon contains  $277\frac{27}{40}$  cubic inches, and a cubic foot of water and its maximum density weighs 62 42 lb.; find the weight of a pint of water correctly to two places of decimals.

3. The capital of a firm consists of £713 3s; £964 17s; £2391 3s. subscribed by three partners; divide £2231 among them in proportion to their several capitals.

4. Find the square root of 5 correctly to seven places of decimals.

5. The area of a rectangular field is  $\frac{2}{3}$  of an acre; and its length is twice its breadth: determine the lengths of its sides approximately.

## 1896.

1. Reduce to lowest terms

$$\frac{\frac{1}{5} \text{ of } 4\frac{1}{2}}{\frac{1}{5} + \frac{1}{6} + \frac{1}{8}}$$

2. A cubic foot of copper weighs 560 lb. It is rolled into a square bar 40 feet long. An exact cube is cut from the bar. What is its weight to four decimals of a pound?

3. The area of a country is 32300000 acres. It consists of 3 kinds of land the areas of which are in proportion to the numbers 2, 3 and  $\frac{5}{2}$ . How many acres are there of each kind of land?

4. If 3 per cent. stock is at  $98\frac{1}{4}$ , how much money must be invested in the stock to yield an annual income of Rs 10?

## 1897.

1. The sum of £177 is to be divided among 15 men, 20 women and 30 children in such a manner that a man and a child may together receive as much as two women, and all the women may together receive £60. What will they respectively receive?

2. Find the value of  $\frac{\sqrt{2} + \sqrt{2}}{\sqrt{2} - \sqrt{2}}$  correct to 7 places of decimals.

3. A garrison of 700 men has provisions sufficient for 10 weeks. How long would they last if the garrison were reduced to 560 men?

4. Find the least common multiple of  $4\frac{1}{2}$ ,  $5\frac{2}{3}$ ,  $6\frac{1}{2}$  and  $7\frac{1}{2}$ .

### 1898.

1. Find the cost of papering the walls of a room 22 feet long 18 feet wide and 20 feet high with rolls of paper 21 inches wide at Rs. 10a. per roll of 12 linear yards

2. Simplify :-

$$\frac{\frac{1}{15}(\frac{2}{5} \text{ of } 2\frac{1}{2} + \frac{1}{2} \text{ of } 1\frac{2}{3})}{\frac{2}{15} \times 1\frac{1}{2} \times 1\frac{1}{2} - \frac{1}{15}} \div \frac{\frac{1}{3}}{\frac{1}{5} \text{ of } 3 - \frac{1}{15} \text{ of } 5\frac{2}{3}}$$

3. A person holding £10,000 in the 3 per cents sells out at  $93\frac{1}{2}$  and invests the proceeds in 4 per cent stock at  $101\frac{1}{2}$ . Find the change in his income, allowing  $\frac{1}{8}$  per cent. commission in each transaction.

### 1899.

1. The length of a hall is three times the breadth. The cost of whitewashing the ceiling at  $5\frac{1}{2}d$  per square yard is £4 12s. 7*id.* and the cost of papering the walls at 1s. 9*d.* per square yard is £35. Find the height of the hall.

2. Show that the difference between the interest and the true discount on a given sum at a given rate for a given time is equal to the interest on the discount.

3. A man has £5. 17s. consisting of sovereigns, half-crowns and shillings in the proportion of 2, 3, 11. How many has he of each coin?

4. Which is the better investment, the  $3\frac{1}{2}$  per cents. at 102 or the 3 per cents. at 97?

### 1900.

1. Find the square root of 4001204.09060x.

2. Find the present worth of Rs 10000 due 8 years hence at  $4\frac{1}{2}$  per cent.

3. A rectangular courtyard, the sides of which are as 5 : 11, costs Rs 144 6*a.* for paving at 10*s.* 6*p.* per square yard. Find the length of its sides.

4. Show that compound interest reckoned quarterly at Rs. 3*a.* 7*1\frac{1}{2}p.* per cent. is nearly equal to interest reckoned yearly at 5 per cent.

### 1901.

1. Find the true discount on a bill for £721. 13*s.* 8*d.* paid 73 days before due, the rate of interest being  $3\frac{1}{2}$  per cent. per annum.

2. Divide each of the numbers 4061250 and 2572125 by 125, and express the ratio of the quotient correctly to three places of decimals.

3. A man buys eggs at 1s. 3d. per dozen and sells them at 1s. 8d. per hundred. Find his gain per cent.

4. There are four vessels of equal capacity:  $\frac{1}{3}$  of the first is filled with spirit,  $\frac{1}{4}$  of the second,  $\frac{1}{5}$  of the third, and  $\frac{1}{6}$  of the last. The first is then filled with water and from this mixture the second is filled up, again from this second mixture the third is filled up and likewise the fourth from the third. What proportion of spirit to water is there in the fourth vessel?

### 1902.

1. Define a prime number. Find the prime factors of 555,555.

2. A railway truck is 29 ft. 4 in. in length; how many such trucks will be required to fill up the entire length of the line between Lahore and Amritsar, a distance of 32 miles?

3. The difference between the simple and compound interest on a sum of money for 2 years at 5 per cent. per annum is Rs 12. Find the sum.

4. If 3 fowls and 4 pigeons cost Rs. 3a. 6p., and 5 fowls and 2 pigeons cost Rs. 12s, find what must be paid for 4 fowls and 3 pigeons.

5. A person sold 60 yards of cloth for Rs 28. 2a. gaining thereby the cost price of 9 yards. Find his gain per cent.

### 1903.

1. Show whether 983 is a prime number or not.

The greatest common measure of two numbers is 373, and their least common multiple is 28721. Find the product of the two numbers.

2. A does  $\frac{1}{5}$  of a piece of work in  $3\frac{1}{2}$  hours, B does  $\frac{1}{4}$  of the remainder in  $1\frac{1}{2}$  hours, and C finishes it in  $5\frac{1}{2}$  hours. How long would it have taken the three working together to do the work?

3. Find the simple interest on Rs. 541. 8a. for 2 years 8 months at 7a. per cent. per month

4. Divide a sum of Rs 345. 12 $\frac{3}{4}$ a. between A, B, C, so that B may receive 25 per cent. more than A, and 20 per cent. more than C.

5. A bought 100 maunds of wheat for Rs 276. 9a., and sold it to B at a gain of 20 per cent.; B sold it to C at a loss of 20 per cent. What price per maund did C pay for the wheat?

### 1904.

1. Resolve 451584 into prime factors, and hence write down its square root.

Find the G. C. M. of the product of the first seven odd numbers and the product of the first eight even numbers.

2. Divide 314159 by 72, using factors, and finding the quotient correct to 3 decimal places.

Find the product of 36.827 and 401.59 correct to 2 decimal places.

3. Find, by Practice, the price of 623 feet of piping at  $5\frac{1}{2}a.$  per foot.

4. A bought a bicycle for Rs 75 and sold it to B at a gain of 2 annas in the rupee; B sold it to C at a loss of  $2\frac{1}{2}$  annas in the rupee. How much did C pay for it?

5. Which of the fractions  $\frac{17}{45}$  and  $\frac{22}{55}$  is nearer the exact value of  $\sqrt{2}$ ? Give reasons.

## 1905.

I. Find the value of.—

(i)  $(2\frac{5}{8} \text{ of } \frac{7}{15}) \div (2.59 \times 3\frac{1}{4}8).$

(ii) The square root of 8103060289.

2. The sum of Rs 840. 1a is to be divided between 7 men, 11 women, 5 boys, and 6 girls, so that for every Rs 3 12a a man received a woman may get Rs 2 3a, and for every Rs 2 10a a woman received a boy may get Rs 1. 14a, and a girl Rs 1 2a. Find how much each person receives.

3. Find the difference between the interest and the discount on Rs 25,078. 2a, the time being 21 months and the rate 4 per cent.

4. What will it cost to make a gravel walk 10 feet wide round the inside of the edge of a square field whose area is 10 acres, at  $4\frac{1}{2}a.$  per square yard?

5. (i) The massacre at Cawnpore took place on the 28th June, 1857. What day of the week was it?

(ii) How many times in the course of the day do the hands of a watch cross each other?

## 1907.

I. Find the greatest number which will divide 16652, 10735 and 1968, and leave remainders 2, 5 and 7 respectively

2. Find, by Practice, the value of 52 acres 3 roods 22 sq. poles at £115. 12. 6 per acre.

3. What sum lent at compound interest will amount to Rs 6143.12.0 in  $2\frac{1}{2}$  years at 5 per cent per annum?

4. If 4 per cent. paper be at 110, what sum must I invest in order to secure a monthly income of Rs 374, after paying an income-tax of 5 pces in the rupee?

5. Simplify the expression:—

$$(3.56 - 648 + 016) \times 142857.$$

## 1908.

I. The circumference of the front wheel of a carriage is  $6\frac{1}{2}$  feet, and of the hind wheel  $12\frac{1}{2}$  feet. How many feet must the carriage pass over so that each wheel may make an exact number of complete revolutions?

2. Find the difference between  $3.14159$  and  $3 + \frac{1}{7 + \frac{1}{17}}$ .

Also find the difference between their squares.

3. A dealer bought a horse for £110, and sold it the same day for £121. 15s., allowing the buyer 5 months' credit. Money being worth  $3\frac{1}{2}$  per cent. per annum, what was his gain per cent.?

4. The total population of India is 294 millions, out of which 150 millions are males. Out of every 1,000 males 98 can read and write, but only 53 per cent. of the total population can do so. Find the percentage of the women of India who can read and write.

5. Prove that the L. C. M. of two given expressions may be found by dividing their product by their H. C. F.

### 1909.

1. What part of Rs. 14a. is  $\frac{1}{5}$  of  $\frac{2\frac{1}{2} - \frac{2}{3} \text{ of } 1\frac{1}{2}}{\frac{1}{2} \times 3\frac{1}{2} + \frac{1}{3}\frac{1}{2}}$  of  $\frac{1}{11}$  of Rs. 5a.?

Divide the difference between 5.5225 and the square of .075 by 126.1.

2. When  $2\frac{1}{2}$  tolas of gold can be purchased for Rs. 8. 6a. 6p. what should be paid for a tola of silver if its value is fixed in the ratio of 1 to  $15\frac{1}{2}$  to that of gold?

3. A, B, and C could reap a field in 18 days; B, C, and D in 20 days; C, D, and A in 24 days; and D, A, and B in 27 days. In what time would it be reaped by them all together?

4. A bookseller began business on 1st January, 1908, with a capital of Rs. 8,000. On 15th September he was joined by a partner, who brought Rs. 1,500 to the business. At the end of December the profits were found to be Rs. 654. Find, to the nearest anna, the share of each.

### 1910.

1. What is the least number which when divided by 36, by 40, by 42, gives in each case 5 as remainder?

2. Simplify  $(\frac{2}{3} - \frac{1}{5})$  of  $(6\frac{1}{2} - 3\frac{1}{3}) \div \{5 - (2\frac{1}{6} - 1\frac{1}{2})\}$ .

Express  $3\frac{1}{175}$  as a decimal fraction.

3. Find, by Practice, the price of 37 cubic yards 3 cubic feet 280 cubic inches at Rs. 5. 8a. 6p. per cubic yard.

4. Explain what is meant by discount and present worth of a bill.

Find the present worth and discount on a bill of £1,036. 4s. due in  $7\frac{1}{2}$  months, interest at  $5\frac{1}{2}$  per cent.

5. A, B and C are partners in a business and their shares are in the proportion of  $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ . A withdraws half his capital at the end of 4 months, and after 8 months more a profit of Rs. 2,024 is divided. What is A's share?

1911.

1. Define the following terms, and give examples to illustrate your definitions.—

Notation ; Numeration ; absolute and local values of digits.

Write in words 2384751690.

What is the local value of each of the significant digits in the following numbers ?

92375, 24.7835.

2. Find the value of —

$$\frac{12 + \sqrt{009}}{1 - \sqrt{4}} \text{ to 3 places of decimals.}$$

Express  $\frac{7\frac{1}{2} - 3\frac{1}{4}}{18\frac{1}{2} + \frac{5}{4}}$  of £33. 14s.  $5\frac{3}{4}d$  as the fraction of £157. 17s.  $8\frac{1}{2}d$ .

3. What is meant by an aliquot part of a quantity ? Is 5s. 4d. an aliquot part of a Rupee ?

Find, by Practice, the price of 256479 articles at £4. 12s.  $6\frac{3}{4}d$  per 100.

4. Define Present Worth and Discount

If the interest on Rs 87. 8s. at 3 per cent. is equal to the discount on Rs 93. 7s. for the same time at the same rate, when is the latter sum due ?

5. A contractor undertook to build a house in 21 days and engaged 15 men to do the work. But after 10 days he found it necessary to engage 10 men more, and then he accomplished the work one day too soon. How many days behindhand would he have been if he had not engaged the 10 additional men ?

1912.

1. Find the sum of 79368 added to itself 65937 times, and write the result in words.

Find the number which will divide 5970 and 5260 and leave remainders 7 and 9 respectively.

2. Simplify  $\frac{727 \times 727 - 273 \times 273}{727 - 273}$ .

Which is the greater of  $27.84 \times 1481$  and  $\sqrt{17}$  ?

3. State and illustrate the difference between *direct* proportion and *inverse* proportion.

If 8 men and 12 boys can finish a piece of work in 12 days, in what time will 40 men and 45 boys finish another piece of work 3 times as great, supposing that 16 men can do as much work in 8 hours as 12 boys do in 24 hours ?

4. A boy buys 6 eggs at 9 for 4d. and sells them at 11 for 5d. What does he gain or lose per cent ?

The difference between the Simple Interest and the Compound Interest on a certain sum of money for 2 years at 4 per cent. is Rs. 20. What is the sum?

5 It is between 2 and 3 o'clock; but a person looking at the clock, and mistaking the hour-hand for the minute-hand fancies that the time of the day is 57 minutes earlier than the reality. What is the true time?

## 1913

1. Explain what is meant by a prime number. Write down all the numbers between 108 and 120 which are prime.

What is the least number which when divided by 12, 15, 20 or 54 leaves in each case a remainder of 4?

2 (a) Explain the meaning of  $\frac{1}{4}$  and  $\frac{1}{4}$ , and show by a diagram that they are equal to one another.

(b) Find the value of  $3 \frac{1}{4}159 \times 45078$  correct to 4 places of decimals (contracted method preferred).

3 Two men undertake to do a piece of work for Rs. 7. One can do it alone in 7 days, the other in 8 days. With the assistance of a boy they finish the work in 3 days. How should the money be divided?

4. Exactly three years ago a man borrowed Rs. 3750 from a bank at 6 per cent. per annum. At the end of a year he paid the interest of that year and part of the loan, altogether Rs. 1200. Similarly he paid Rs. 800 at the end of the second year. What sum did he now pay to clear off the debt?

5 The area of a square is 11370 32 square inches. Find the length of its diagonal.

## O.I

1. Find the least number which when divided by 33, 171, and 1900 will always leave the same remainder 21.

Simplify 
$$\frac{2\frac{1}{2}+5^3}{2\frac{1}{2}-1\frac{1}{2}} + \frac{2\frac{1}{2}+1\frac{1}{2} \text{ of } 1\frac{1}{2}}{4\frac{1}{2} \text{ of } 1\frac{1}{2}-1\frac{1}{2}}.$$

2 Add together  $\frac{1}{10}$  of Rs. 12 1a 1p.  $\frac{4}{5}$  of Rs. 35 10a. 11p., and  $\frac{3}{4}$  of Rs. 42 11a. 4p.; express the result as a fraction of £45. 6s. 8d., being given that 1 Rupee = 1s. 8d.

3. A room is  $27\frac{1}{2}$  ft long,  $21\frac{1}{2}$  ft wide, and 4 yds high. Find the cost of papering the walls at 9 pces per square yard.

Find, by Practice, the wages of a man for 3 weeks 2 days and 4 hours at Rs. 3 a week, reckoning 6 days to a week and 12 hours to a day.

4. In what time will Rs. 1300 amount to Rs. 1493 8s. at  $3\frac{1}{3}$  per cent. per annum simple interest? State this as a "present worth" sum.

5 A lady wishing to relieve a number of poor people, finds that if she gives them a shilling each she will have 3s. 4d. left, and that in order to enable her to give them 1s. 4d. each, she would require 2 d more than what she has; how many are there to be relieved, and how much money has she to distribute?

1922

1. Find the greatest number by which 2500 and 3300 can be divided so as to leave remainders 4 and 36 respectively

$$\begin{array}{r} \frac{2\frac{1}{2}}{3\frac{1}{2}} + \frac{2\frac{1}{2}}{7\frac{1}{2}} + \frac{2}{7} \\ \frac{5}{7} + \frac{1}{3} + \frac{2}{7} \\ \hline 5\frac{1}{14} - 4\frac{1}{2} \end{array}$$

Simplify

2. Find the value of

$\frac{1}{17}$  of 35. 6d +  $\frac{1}{5}$  of £1. 7s. 6d +  $\frac{1}{6}$  of £4. 17s. 4d.

Express the result as a fraction of Rs. 29. 8a, counting 1s. 8d. for a rupee.

3. Find, by Practice, the value of 10 tons 4 cwt 2 qr. 12 lbs. at £1. 3s. 4d per ton.

4. Explain the meaning of the terms "interest" and "rate per cent." If Rs. 1160 amount in 7 months to Rs. 1210. 12a, find the rate per cent. per annum.

If oranges be bought at the rate of 16 for a rupee, how many must be sold for a rupee to gain 25 per cent. ?

5. Divide Rs. 12540 among A, B, C so that A shall receive  $\frac{1}{5}$  as much as B and C together, and B  $\frac{1}{3}$  of what A and C together receive.

1923.

1. Simplify  $\frac{\sqrt{254016} - \sqrt{10609}}{\sqrt{254016} + \sqrt{10609}}$  expressing the result correct to four decimal places

2. Find the value of

$\frac{1}{17}$  of £23. 16s. 8d +  $\frac{1}{7}$  of £54. 16s. 6d -  $\frac{1}{11}$  of £2 as 3d.

Express the result as a fraction of Rs. 560, counting 1s. 9d for a rupee.

3. Find, by Practice, the price of 37 maunds 15 seers 12 chataks at Rs. 16. 10a. 8d per maund.

4. A person borrowed Rs. 1460 from the Punjab National Bank on the 1st of January and repaid the amount on the 6th May of the same year. He had to pay Rs. 45 as interest. Find the rate of interest per cent. per annum.

A merchant sells out sugar to a customer, using false weights, and thereby gains 11 $\frac{1}{2}$  per cent. on his outlay. What weight does he substitute for one seer?

5. A path 9 feet wide, running all round a square park, has an area of exactly 3 acres. Find the area of that part of the park enclosed by the path, and the cost of covering this part with grass at 2a. 6d per square yard.

## V. UNIVERSITY OF ALLAHABAD. ENTRANCE PAPERS.

1889.

1. Define a fraction and shew that  $\frac{1}{2} = \frac{2}{4}$ .

By how much does the difference of  $1\frac{1}{8}$  and  $\frac{5}{8}$  fall short of their sum ? Express the defect as a decimal.

2. (a) Simplify  $\frac{3\frac{1}{2} - 1\frac{1}{2} \text{ of } 1\frac{1}{2} - 1\frac{1}{2}}{(3\frac{1}{2} - 1\frac{1}{2}) \text{ of } (1\frac{1}{2} - 1\frac{1}{2})}$ .

(b) Subtract '03 from '63 and divide the result by '102.

3. Find the square root of '001 to four places of decimals. What number has '1 for its square root ?

4. What sum of money will amount to R1,381.4.0 in 15 months at 5 per cent. per annum simple interest ?

5. How long will it take to walk along the four sides of a square field which contains 16 acres 401 square yards, at 3 miles an hour ?

6. *A* and *B* complete a piece of work in 8 days ; *B* and *C* do the same in 12 days ; and *A*, *B* and *C* finish it in 6 days. In how many days will *A* and *C* complete the work ?

7. *A* who travels  $3\frac{1}{2}$  miles an hour starts  $2\frac{1}{2}$  hours before *B* who goes the same road at  $4\frac{1}{2}$  miles an hour ; where will *B* overtake *A* ?

1890.

1. Multiply '347695 by 2 0026, and divide the product by '01905.

2. Simplify  $1\frac{1}{2} + 3\frac{1}{2} - 5\frac{1}{2} + 2\frac{1}{2} - 1\frac{1}{2}$ .

3. Find, by Practice or otherwise, the value of 2345 md 27 seers 10 ch. of wheat at R3 10 8 per md.

4. Extract the square root of  $1 - (00135)^2$  to 5 places of decimals

5. The weight of a cu. in. of water is 253 '7 grains, that of a cu. in. of air is '31 grains ; find to 3 places of decimals how many cu. in. of water are equal in weight to one cu. ft. of air.

6. On measuring a distance of 32 yd with a rod of a certain length it was found that the rod was contained 41 times with  $\frac{1}{2}$  an inch over. How many inches will there be over in measuring 44 yd. with the same rod ?

1891

1. Define "Notation", "Numeration" ; and prove that "three times four" = "four times three".

2. Reduce to a single fraction .—

$$\frac{919\frac{1}{7}}{7\cdot954} + \frac{4\text{ sicd}}{442\frac{3}{7}} + \frac{7}{11} \text{ of } '07344.$$

3. The wine in a pipe when full is worth £19. 9s. 9d. How much has leaked away if what is left is worth £9. 16s. 7 $\frac{5}{14}$ d. ?

4. In discounting a bill, what do you mean by "The Banker's profit"? If the simple interest on £923 18s 1 $\frac{1}{2}$ d amounts to £17 9s 3 $\frac{3}{4}$ d exactly in 138 days, what is the rate of interest per cent per annum?

5. Extract the square roots of 99,980,001, and of 60 $1\frac{1}{8}\frac{1}{4}$ .

1892

1. How is a fraction affected by adding the same number to the numerator and the denominator?

Prove that  $\frac{3+4}{4+5}$  is greater than  $\frac{1}{2}$  and less than  $\frac{2}{3}$ .

2. (a) Divide  $\frac{1}{2}[3+\frac{1}{2}(3+\frac{1}{2}(3+1\frac{1}{2}))]$  by 125.

(b) Reduce  $1\frac{1}{4}\frac{1}{2}$  and  $1\frac{1}{2}\frac{1}{4}$  to their lowest terms and express their difference as a decimal.

3. Forty men finish a piece of work in 40 days, if 5 men leave the work after every tenth day, in what time will the whole work be completed?

4. Find the difference between the Simple Interest and Discount of £330 in 4 years at 2 $\frac{1}{2}$  per cent per annum.

5. Extract the square root of  $\frac{1000 \ 2001}{1000}$

1893

1. Two recurring decimals are added together; prove that the number of digits in the period of the result cannot exceed the product of the numbers of the digits in the original periods.

2. Find the value of  $\frac{5}{4}$  of 30 $\frac{1}{2}$  of 1 mile 5 fur. 30 poles.

3. Multiply Rs 2 anna 1. by  $\frac{\frac{1}{2}+\frac{1}{3}+\frac{1}{5}+\frac{1}{7}}{\frac{1}{2}+\frac{1}{3}+\frac{1}{5}+\frac{1}{7}}$

4. Find, by Practice, the cost of 10 cwt. 3 qr. 23 lb 8 oz at £1. 5s 8d. per cwt.

5. A sum of money was divided amongst 5 people; 4 of them received respectively 15,  $\frac{1}{2}$ s, 1,  $\frac{1}{2}$  of the whole, while the 5th received £105 3s. 6d. What was the sum divided?

6. An oz of standard gold, one-twelfth of which is alloy, is worth £3 17s 10 $\frac{1}{2}$ d. How many sovereigns would be coined from 36 lb 8 oz of pure gold?

7. Find the square root of 6246 05 $\frac{1}{2}$ 024 and of 71 $1\frac{1}{2}\frac{1}{4}$

1894

1. (a) A multiplication sum having been worked is partially rubbed out; the figures that remain are the entire multiplicand 999 and the last three digits 193 in the product. Restore the complete work.

(b) Simplify  $\frac{1}{1\frac{1}{8}} \times \frac{1 + 0025 \times 05}{1 - 0025 - 05} - \frac{45 \times 35}{8}$ .

2. (a) What decimal of R100 must be added to  $\frac{141}{100}$  of R5 10. 8. that the sum may be 10 annas?

(b) Extract the square root of 256

3. Two trains start at the same time from Mirzapur and Delhi and proceed towards each other at the rates of 16 and 21 miles per hour respectively. When they meet it is found that one train has travelled 60 miles more than the other. Find the distance between the two stations.

4. Two years and six months ago, I borrowed a sum which with simple interest at 6 per cent per annum now amounts to R638.4. Find the sum.

### 1895.

1. (a) Explain what is meant by the following terms —

*Prime factors; common measure; common multiple; lowest common multiple.*

(b) A courtyard 452 feet long and 404 feet wide, is to be paved with square stones all of one size. What is the largest size which can be used?

2. (a) Simplify  $\frac{575}{425}$  of  $\frac{1}{4} + \frac{5}{7} + \frac{4}{5} \times \frac{1}{7} - \frac{1}{2}$ .

(b) Find the square root of 3 1415926 to four places of decimals.

3. The difference between the Interest for 4 months, and the Discount, on a certain sum due in 4 months at 4 per cent, is one rupee. What is the sum?

4. A merchant sells silk of two qualities which cost him R5 5a 4p. and R4. 4a 4p. per yard, respectively. The selling price of the latter is two-thirds that of the former, but the quantity sold is double and the merchant gains 25 per cent. on the whole. Calculate the selling price per yard of each.

5. A policeman goes after a thief who has 100 yards' start; if the policeman run a mile in six minutes, and the thief a mile in ten minutes, how far will the thief have gone before he is overtaken?

### 1896.

1. Simplify :—

$$(a) 5 - 5 \times \frac{2 + 1\frac{1}{2}(2 + 1\frac{1}{2})}{1\frac{1}{2} + 2(2 + 1\frac{1}{2})}.$$

$$(b) \frac{125 \times (175 \text{ of } 285714)}{.00025}.$$

2. (a) Express  $\frac{3}{8}$  of 7s 6d. + 1.25 of 5s - 54.5 of 9s. 2d. as a decimal fraction of £10

(b) Extract the square root of 40000.400001.

3. What is an aliquot part of a quantity?

Find, by Practice, the time of building a wall 27 yards long, 1 yard thick and 6 ft. high, of which one cubic yard is built in 3 hours 18 minutes and 45 seconds.

4. How far shall I ride with a friend who leaves Allahabad at 9 A. M. and will drive to Karchana which is 10 miles from Allahabad in one hour, that I may, by walking back at the rate of 4 miles an hour, reach home at 11.30 A. M. ?

5. A owes B Rs 1435 due at the end of 4 months, Rs 630 due at the end of 8 months, Rs 860 due at the end of a year. B wants his money forthwith. What ought A to pay him reckoning interest at  $7\frac{1}{2}$  per cent. ?

## 1897.

1. What is the largest number which divides both 2397 and 2491 without remainder? What is the smallest number which is divisible by both of these numbers?

2. State and prove the rule for pointing in multiplication of decimals, why is the removal of the decimal point one place to the right equivalent to multiplication by 10? Illustrate your answer by comparing the numbers 23.015 and 230.15

Find the square root of 08027

3. A person lent another a sum of money for 72 days at 3 per cent. per annum. At the end of that time he received £293. 12s. 0 $\frac{1}{2}$ d. What was the sum lent?

4. The compound interest on a sum of money for 3 years at 5 per cent. is £331 or. 3d.; what is the simple interest?

5. If a rupee is worth one shilling and three pence half-penny, and a shilling is worth 1.25 francs, what is the value in francs of 1,365 rupees?

## 1898.

1. Define measure of a number and find the G. C. M. of:—

(1) Rs 2. 4 $\alpha$  and 10 $\alpha$ .

(2)  $\frac{2}{3}$  and  $\frac{5}{6}$

Find the greatest number which will divide 13956 and 14565 and leave a remainder 7 in each case.

2. Simplify:—

$$(a) \frac{\left(\frac{1}{2}\right)^2 + \left(\frac{1}{3}\right)^2}{\left(\frac{1}{2}\right)^2 + \left(\frac{1}{4}\right)^2} \times \frac{125 \text{ of Rs. } 5. 10\alpha 8\text{d}}{125 \text{ of Rs. } 7. 12\alpha}$$

$$(b) \frac{1}{2} - \frac{1}{3} - \frac{1}{4} \text{ of } \frac{1}{2} \div \frac{1}{3} \times \frac{1}{4}$$

3. Extract the square root of

$$9 + \frac{1}{9 + \frac{1}{9 + \frac{1}{9 + \frac{1}{6}}}}$$

and calculate the difference between this square root and  $3 + \frac{1}{18} \sqrt{2}$  to three places of decimals

4. Find the cost in English money of travelling from Vienna to Trieste, a distance of 363 English miles, the average cost per German mile being 13 kreutzers. Given that

$$1 \text{ German mile} = 4\frac{1}{2} \text{ English miles.}$$

$$1 = 25\frac{5}{9} \text{ francs.}$$

$$375 \text{ francs} = 105 \text{ kreutzers.}$$

5. What is the present value of a legacy of £149. 1s. 3d. due seven years hence at  $2\frac{1}{2}$  per cent. simple interest?

1899.

1. Simplify :—

$$\frac{\frac{1}{2} + \frac{1}{3} \text{ of } \frac{1}{4} + \frac{1}{6}}{\frac{1}{3} \text{ of } (1 + 5\frac{1}{2}) + \frac{1}{6} \text{ of } \frac{1}{3} \text{ of } (7 - 2\frac{2}{3}) - \frac{1}{4}}$$

and express  $\frac{1}{6}$  of R1. 5a. as the decimal of R1. 4a.

2. A number may be divided by 125 by multiplying it by 8, and then marking off the last three digits as decimals. Explain the reason for this; and divide 5335 by 125.

3. What is the meaning of an "aliquot part"?

Find, by Practice, the value of 24 tons 3 cwt. 2 qrs. 25 lb. at £17. 11s. 6d. per ton.

4. A piece of work can be done in 72 days by 17 men working together. If after 9 days of work these are joined by 4 others, in how many days will the work be finished?

5. Extract the square root of 5 and of 5 each to 4 places of decimals; and show that the square root of  $\frac{1}{4}$  is .6

6. What is the difference between the interest on a bill of £138. 13s. 4d. for 3 months at 4 per cent. per annum and the discount on the same for a quarter of a year at the same rate?

7. (a) A speculator sells at a profit of 50 per cent., but his purchaser fails and only pays 8a. in the rupee. How much per cent. does the speculator gain or lose by his venture?

(b) A person investing in the 4 per cents. receives 5 per cent. for his money. What is the price of stock?

1900.

1. State the rules for multiplication and division of decimal fractions

Assuming that the surface of a sphere is  $3\frac{1}{4}16$  times the square of its diameter and that the earth is a sphere whose diameter is 8000 miles, find what fraction of the whole surface of the earth is the area of India which is 1350000 square miles. Express your result as a decimal fraction.

2. What are circulating decimals? Distinguish between pure and mixed circulating decimals.

(a) Add together  $\frac{1}{3}$ ,  $\frac{1}{5}$ ,  $\frac{1}{7}$ ,  $\frac{1}{9}$  and express the sum as a mixed circulating decimal.

(b) Reduce  $041\bar{6} \times \frac{1428\bar{5}}{(1\frac{1}{2} + \frac{1}{3}) \times 40}$  of R8. 5a. to the fraction of 1 anna.

3. (a) Find, by Practice, the price of 100 bags of Rosa sugar, each weighing 4 seers 2 powsas and 3 chataks, at 6a. 9p. per seer.

(b) Find the square root of 10 82 to three places of decimals.

4. What sum of money will amount to Rs 3528 in two years at 5 per cent. compound interest, and what will it amount to in two more years?

5. What monthly income will be derived from the investment of one lakh of rupees in the 3½ per cent. Government of India paper at 100 4/8?

### 1901.

1. (a) What is the greatest length which is contained a whole number of times exactly in both  $25\frac{1}{8}$  feet and  $21\frac{9}{16}$  feet?

(b) Find the value of

$$\frac{49}{21} \text{ of } \frac{\left(\frac{1}{2} - \frac{2}{3}\right) + \frac{5}{6}}{\frac{2}{3} \div \left(\frac{1}{2} + \frac{1}{3}\right)} \text{ of } \text{£}46.$$

2. (a) Express the difference between 9428571 and .857142 as a vulgar fraction in its lowest terms

(b) Extract the square root of  $\frac{.0253 \times .365}{8.03}$  to five places of decimals.

3. In a two-mile race A wins, B being 22 yards behind and C 106 yards behind B. By how much would B beat C in a three-mile race?

4. What sum at compound interest will amount to Rs 50 at the end of the first year and to Rs 76 at the end of the second year?

5. How much 3½ per cent. Government Securities at 95½ must be sold in order to purchase enough 5 per cent. Calcutta Municipal Debentures at 119½ to produce an annual income of Rs 65, a brokerage of ¼ per cent. being charged on each transaction?

### 1902.

1. Find the G. C. M. and also the L. C. M. of 49.383 and 142569.

$$2. \text{ Simplify } \frac{1.5}{0.75} \times \frac{3\frac{1}{2}}{1\frac{1}{2}} + \frac{1.875}{2.1} \times \frac{3.5}{3.75} - 1.6$$

3. Find, by Practice, the value of 246½ maunds of sugar at Rs 13. 5a. 4p. per maund

4. A and B have between them 132 horses, .25 of A's = .142857 of B's. How many has each of them?

5. Six men and five boys can do a piece of work in 7 days; they work at it till they have completed  $\frac{2}{3}$  of it; then two of the men leave and two more boys come. How long will the work be in hand, if a boy does half as much work as a man?

6. If I lend a friend Rs 1250 at 4 per cent. simple interest and tell him to keep it until principal and interest amount to Rs 1666. 10a. 8p., how long will he have it?

## 1903.

1. (a) How many lengths of  $2\frac{1}{2}$  inches each can be cut from a rod  $7\frac{1}{4}$  feet long, and what will be the length of the portion left?

(b) Reduce  $\frac{3}{4}$  of Rs 4, 7a. 3f. to the fraction of  $\frac{1}{5}$  of Rs 7. 14a. 8f.

2. (a) Divide 016085 by 3.125; and express  $1\frac{453}{5} - 1\frac{5}{5}$  as a decimal.

(b) Simplify :—

$$\frac{5.5}{63} \times \frac{.081}{4.2} \times \frac{4.9}{33}$$

3. *A* and *B* can do a piece of work in 12 days; after working 2 days they are assisted by *C*, who works at the same rate as *A*, and the work is finished in 6 $\frac{1}{2}$  days more: in how many days would *B* alone do the work?

4. The 4 P. M. passenger train from Delhi to Tundla stops first at Ghaziabad,  $12\frac{1}{4}$  miles distant, at 4.30 P. M.; the whole journey is  $127\frac{1}{2}$  miles, and 20 per cent. of the time is expended in stoppages: at what time is the train due at Tundla?

5. At what rate per cent. simple interest will Rs 33. 5a. 4f. amount to Rs 52. 1a. 4f. in 3 years and 2 months?

## 1904.

1. Simplify :—

$$(a) \frac{\frac{L44}{1}}{1 + \frac{2}{7 + \frac{3}{8 + \frac{1}{1}}}} \div \frac{1}{5} \text{ of } L1. 13s. 4d.$$

$$(b) \frac{.00281 \times .0525}{1.405}.$$

2. (a) A bankrupt's liabilities are £6,235. 10s. and he pays his creditors 5s. 6d. in the pound. Find, by Practice, the amount of his assets.

(b) Find the square root of 10 001 correct to four places of decimals.

3. If 3 p. c. more be gained by selling a horse for £83. 5s. than by selling him for £81, what is the original price of the horse?

4. What will Rs 1,000 amount to in 3 years at 5 p. c. per annum compound interest?

5. If the 3 per cent. consols are at 92 $\frac{1}{2}$ , what sum of money must be invested in this stock to get an annual income of £630 brokerage being  $\frac{1}{2}$  per cent.?

## 1905.

1. (a) Simplify :—

$$\frac{7\frac{1}{2} + 1\frac{1}{2} - \frac{3}{4}}{6\frac{1}{2} - 1\frac{1}{2} + \frac{3}{4}} \div \frac{1}{2} \text{ of } \frac{1}{1 + \frac{2}{4\frac{1}{2}}}.$$

(b) Find the value of  $\frac{1}{\sqrt{8}}$  correct to four places of decimals.

2. (a) Add together 175 of 1 ton, 83 of 1 cwt. and 93 of 1 lb. and reduce the sum to the decimal of 10 tons.

(b) Find, by Practice, the rent of 3 acres 1 rood 27 poles of land at £1 16s 8d. per acre.

3. By selling a horse for Rs 50 a man lost 4 per cent; find what would have been his gain or loss per cent if it had been sold for Rs 60.

4. Find the discount on Rs 1,000 due 3 months hence at 4 per cent. per annum.

5. A person transfers £1000 stock from the 4 per cents at 90 to the 3 per cents. at 72: find the alteration in his income.

### 1906

(1)

1. A merchant has three kinds of wine. of the first kind 403 gallons, of the second 434 gallons, and of the third 465 gallons. What is the least number of full casks of equal size in which this can be stored without mixing?

2. Find the sum of money that is the same fraction of 5 crowns that Rs 8s, is of Rs 5s 4d.

3. A sum of money amounts in 10 years at 4½ per cent simple interest to Rs 2,972 8s. In how many years will it amount to Rs 4,356 4s.?

4. Extract the square root of 15848361.

### 1907.

1. Is 823 a prime number? Why is it unnecessary to try factors above 23 in answering the question?

2. Show that to 3 figures  $\pi = 3.142$ , and that to 5 figures  $\pi = 3.14159$ , where  $\pi = 3.14159265$ .

3. Find the quotient of 6893 7825 by 72 6328 correct to four figures.

4. Find to 3 decimal places the square root of 5.

### 1908

1. Find the sum of the 21 odd numbers which follow 15432.

2. Reduce  $\frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \frac{4}{5} - \frac{1}{6} - \frac{1}{7}$  to a fraction in its lowest terms.

3. Find all the prime numbers less than a hundred.

### 1909

1. A metre = 39 3708 inches. Express 325 of a metre as a decimal of a yard (to six figures).

2. What will be the gain per cent if mangoes bought at the rate of six for 5s are sold at the rate of five for 6s?

3. In the first four months of 1906 the Indian Government sold Bills amounting to Rs 97,984,311, obtaining £6,537,578 in exchange. Find the value of a rupee in English money to the nearest tenth of a penny.

*N.B.* Use no more figures than are necessary to obtain a result to the degree of accuracy indicated.

4. A holder of Rs 5500 of 3½% Government paper sells at 91½ and invests in 4% stock at 101. If the brokerage is ½ for the first and ¼ for the second, find the change in his income.

## 1910.

1. Write in figures the number—ninety-nine billion ninety-nine million ninety-nine thousand and ninety-nine.

Simplify 
$$\frac{.0075 \times 2.1 + 4.255 \times .064}{.0175} = \frac{.00032}{.00032}$$

2. Find the least integer exactly divisible by  $5\frac{1}{4}$ ,  $7\frac{1}{2}$ , and 9.

Extract the square root of 76300225.

3. What sum put out at compound interest at 5 per cent. would amount in 3 years to £810. 6s. 9d.?

## 1911.

1. Write in figures the number—nine billion eighty-nine million nine thousand and ten.

Simplify 
$$\frac{4428571 + 5571428}{2285714 + 7714285} = \frac{1}{2}$$

2. Define the terms *yard* and *metre*.

If one inch is equal to 25·4 millimetres, find the number of kilometres in a mile.

3. Extract the square root of 115742841.

## 1912.

1. A hall is 10'01 metres high, 40 metres long, and 8'001 metres wide. Find the number of cubic millimetres it contains, and write your answer in words.

2. Simplify (1) 
$$\frac{6\frac{1}{2} + 3\frac{7}{8} \text{ of } 1\frac{1}{7} - 4\frac{1}{8}}{1\frac{1}{2} - 1\frac{1}{8} - 3\frac{1}{8} + 4\frac{1}{8}}$$
,

and (2) find 0·41375 of £2. 10s.

3. Find the price of 3 per cent stock when an increase of income of £5 6s. 3d. is made by transferring to them a sum of £4,375 3½ per cent. stock at 95½.

## 1913.

1. Simplify :—

$$\frac{7\frac{1}{2} \times 5\frac{1}{2} + 5\frac{1}{2} \times 3\frac{1}{2} - 2\frac{1}{2} - \frac{1}{2} \times 1\frac{5}{8} \div 4\frac{1}{8}}{7\frac{1}{2} - 5\frac{1}{2} - 3\frac{1}{2} - \frac{1}{2} \times 3\frac{1}{2} + 1\frac{1}{8}} = \frac{5\frac{1}{2}}{5\frac{1}{4}}$$

2. Extract the eighth root of 214358881.

3. A man subscribes to a provident fund 4% of his income; on the remainder he pays income-tax at 5 pies in rupee, and after this deduction he gives  $\frac{1}{12}$  of the remainder in charity. Of the remainder he gives  $\frac{1}{7}$  to his mother, who thus receives Rs 12 a month. Find the man's gross annual income.

4. An acre is  $0.40467$  hectare, and £1 is equal to  $25.25$  francs. An estate measuring  $1927$  hectares is sold for ten million one hundred thousand francs. What is this in pounds per acre?

1914.

1. (1) Simplify :—

$$\frac{4\frac{1}{4} - 2\frac{1}{4}}{4\frac{1}{4} - 3\frac{1}{4}} - \frac{81}{4 - \frac{4}{2\frac{1}{4}}} \text{ of } \frac{1}{3}.$$

(2) Add together  $\frac{1}{5}$  of £1,  $\frac{2}{5}$  of 1s., and  $\frac{3}{5}$  of 1d., and express the sum as the decimal fraction (correct to two places) of one guinea.

2. Find the square root of  $25 + \sqrt{125}$  correct to three places of decimals.

3. A sells an article to B at a profit of 20 per cent. B sells it to C at a profit of 5 per cent. If C pays 70s., what did it cost A?

4. I invest equal sums in a 4 per cent. stock and in a 3 per cent. stock and get 5 per cent. for my money; the 4 per cents. are at 90; what is the price of the 3 per cents.?

1915

1. Find the square roots of (1) 3036.01, (2) 1 to three places of decimals.

2. Prove that the product of any two numbers is equal to the product of their H. C. F. and their L. C. M.

The L. C. M. of two numbers is 24,488, and their H. C. F. is 84. If one of the numbers is 1428, find the other.

3. A rectangular lawn 51 ft. long is surrounded by a path which is 4 ft. 6 in. wide. If the path is 96 sq. yds. in area, find the breadth of the lawn.

4. If £766 13s. 4d. is the discount on £4600 due in  $2\frac{1}{2}$  years, what is the rate per cent., at simple interest?

1916.

1. Simplify

$$\left\{ \frac{\frac{4}{5} + \frac{2}{3}}{\frac{2}{5} + \frac{1}{3}} + \frac{\frac{3}{2} - \frac{1}{2\frac{1}{2}}}{\frac{1}{2} + \frac{1}{2\frac{1}{2}}} \right\} \text{ of } 4 \text{ tons } 7 \text{ cwt. } 21 \text{ lb.}$$

2. Carpet 2 ft. wide at 6s. 9d. per yd. for a room 25 ft. 4 in. wide costs £30. 8s., and paper 1 ft. 6 in. wide at 2d. per yd. for its walls costs £5. 5s. (no allowance to be made for doors or windows). What is the height of the room?

3. The manufacturer of an article makes a profit of 25 per cent., the wholesale dealer makes a profit of 20 per cent., and the retailer makes a profit of 28 per cent. What is the cost of production of an article retailed for 16 shillings?

## 1917.

1. (1) Simplify

$$\frac{1\frac{2}{3}}{5 - \frac{1}{1\frac{1}{2}}} \times \frac{2\frac{1}{2} \times 1\frac{2}{3}}{2\frac{1}{2} - 1\frac{2}{3}} \times \frac{3\frac{1}{2}}{5\frac{1}{2}} \div 1\frac{7}{13}$$

(2) Find a fourth proportional to  $1\frac{2}{3}$ , 0.09,  $\frac{5}{16}$ ; and express the result as a decimal.

2. (1) Reduce 0.07 of £1. 5s + 0.675 of £2. 1s. 8d. + 0.1875 of 8s to the decimal of £10.

(2) Find the square root of 2 to four places of decimals.

3. A man buys milk at  $2\frac{1}{2}$ d. per quart, dilutes it with water and sells the mixture at 3d. per quart. How much water is added to each quart of milk if his profit is 60 per cent.?

4. Find the present value of £845, due 2 years hence, compound interest being reckoned at 4 per cent per annum.

## 1818

1. (a) Find the number nearest to 100,000 that can be divided exactly by 2, 3, 4, 5, 6 and 7 respectively.

(b) A man in India wishes to send to his son in England £300 a year in monthly instalments. How much will he have to pay monthly in rupees; the value of 1 rupee in English money being £0.1542d.?

2. One revolution of the pedal crank drives a bicycle a distance equal to the circumference of a circle of 70 ins. diameter. How many revolutions does the crank make in travelling 1 mile? If the wheels are 28 ins. in diameter how often do they revolve in the same distance? [ $\pi = \frac{22}{7}$ ]

3. One clock gains 25 secs a day while another loses 1 minute a day. They are both set at the right time at 8 A. M. in August 15. On what day and at what time will they differ by 1 hour?

## 1919.

1. (a) Find all the prime numbers that divide both 1287 and 1144 without remainders

(b) Simplify

$$(1) \frac{3\frac{2}{3} + (4\frac{2}{3} \times 2\frac{2}{3})}{6\frac{2}{3} - (1\frac{2}{3} \times 2\frac{2}{3})}; \quad (2) \frac{12.32 - 7.56}{20.35 + 3.45}$$

2. The inside measurements of a room are 42 ft. 6 ins. and 22 ft 9 ins.; the walls are 2 ft 3 ins. thick and there is a verandah all round 10 ft. 6 ins. wide. Find the cost of paving the verandah with tiles measuring  $4\frac{1}{2}$  ins. by 3 ins. and costing 6 pices each.

3. Which is the system of payment most advantageous for the student if the rate of interest obtainable is 6% in the following case?

"For students commencing the course the entrance fee is Rs. 30. The entrance fee is payable by all students at the commencement of the course or may be paid in three instalments of Rs. 12 each at the beginning of the first, second and third years respectively."

VI. UNIVERSITY OF PATNA. ENTRANCE PAPERS.

1918

COMPULSORY PAPER.

1. (a) Multiply 876095 by 567049.

Or,

Two numbers when divided by a certain divisor leave the remainders 4375 and 2935 respectively ; but when the sum of the two numbers is divided by the same divisor, the remainder is 2361. Find the divisor.

(b) Find the G. C. M. of 64176 and 119184.

Or,

What is the least number which, when divided by 6, 8, 12, 15, or 20, leaves a remainder of 5 ?

2. (a) Simplify—

$$\frac{4\frac{1}{7} - 2\frac{1}{3}}{3\frac{1}{7} + 1\frac{1}{7}} = \frac{1}{2 + \frac{1}{2 + \frac{1}{5 - \frac{1}{2}}}}$$

Or,

Find the cost of 313 articles at £2. 17s. 11d. each.

(b) Multiply 3.25 by 0.0133, and divide the product by 3.64

Or,

Find the value of  $\frac{\text{R}1\ 9a.}{\text{R}6.\ 4a.}$  of 3 guineas, and express the result as decimal fraction of £5

3. (a). What sum will amount to R587. 8a. in  $3\frac{1}{2}$  years at 5 per cent. per annum simple interest ?

Or,

In what time will £12345 13s. 9d. double itself at 4 per cent. per annum simple interest ?

(b) A does  $\frac{1}{17}$  of a piece of work in 14 days ; he then calls in B, and they finish the work in 2 days. How long would B take to do the work by himself ?

1918.

ADDITIONAL PAPER.

1. Evaluate  $\sqrt{.67} - \sqrt{.07}$  to 6 places of decimals.

2. How many litres of water weigh 1000 lbs., given that one cubic foot of water weighs 1000 ozs., and one metre = 39.37 inches ?

3. Find the value of the following series correct to four places of decimals :—

$$\frac{1}{3^1} + \frac{1}{3^2 \cdot 2} + \frac{1}{3^3 \cdot 3} + \frac{1}{3^4 \cdot 4} + \dots$$

4. What must be the least number of soldiers in a regiment, to admit of its being drawn up 5, 6, 7, 8, 9, or 10 deep, and also of its being formed into a solid square ?

1919.

COMPULSORY PAPER.

1. (a) Multiply 79094451 by 7640950

Or,

Find the greatest and least numbers of six digits which are exactly divisible by 789

(b) A heap of pebbles can be made up exactly into groups of 25; but when made up into groups of 18, 27 and 32, there is in each case a remainder of 11. Find the least number of pebbles such a heap can contain.

Or,

A grocer buys 10 cwt. 3 qrs. 21 lbs. of sugar for £30, and pays 12s. 6d. for expenses; at what rate must he sell it per pound to clear £15. 6s. 3d. by his bargain ?

2. (a) Simplify

$$\left\{ 2\frac{5}{4} + \frac{5}{4} \text{ of } \frac{7}{3\frac{1}{4}} - 1\frac{1\frac{3}{4}}{2\frac{1}{4}} \right\} - 1\frac{77}{228}$$

Or,

Express  $\frac{5}{8}$  of 12s. 6d. + 625 of 7s. 6d. - 50 $\frac{5}{8}$  of 16s. 6d. as the decimal of £1.

(b) Find the cost of 9 yds. 2 ft. 10 in. at 5s. 7 $\frac{1}{2}$ d. per yard.

Or,

What would be the cost of painting the four walls of a room whose length is 24 ft. 3 in., breadth 15 ft. 3 in., and height 11 ft. 6 in., at 4s. a square foot ?

3. (a) What sum will amount to £425. 19s. 4 $\frac{1}{2}$ d. in 10 years at 3 $\frac{1}{2}$  per cent. simple interest ?

Or,

If the 6d. loaf weigh 4.35 lbs. when wheat is 5 75s. per bushel, what ought to be paid for 49.3 lbs of bread when wheat is 9 2s. per bushel ?

(b) If 200 men can make an embankment 5 miles long in 25 days, how much overtime must 60 men work to finish an embankment 2 miles long in 32 days, 12 hours being a day's work ?

Or,

A man walks a certain distance, and rides back in 3 hrs. 45 min.; he could ride both ways in 2 $\frac{1}{2}$  hrs. How long would it take him to walk both ways ?

1919

## ADDITIONAL PAPER

1 Find the square root of '00249976000576.

*Or,*

A square field contains 40 acres. Find the cost of running a fence round it at 2s 6d a yard

2 Given that a metre contains 39 37 inches, express five miles in kilometres and metres, correct to the nearest metre

*Or,*

Find the value of

$$1 - \frac{1}{12} + \frac{1}{123} - \frac{1}{1234} + \frac{1}{12345} - \dots \dots$$

correct to 4 places of decimals

1920.

## COMPULSORY PAPER

1. Multiply 915625 by 961024  
 2. Prove that  $95735^2 - 94340^2 = 16575^2$ .  
 3. Reduce to its lowest terms  $\frac{444}{44444}$ .  
 4. Simplify  $\frac{\frac{3}{7} + \frac{1}{5}}{\frac{1}{7} + \frac{1}{9}} \text{ of } \frac{13s}{9s} \frac{5d}{10d} - \frac{2}{5} \left( \frac{1}{7} + \frac{1}{5} \right) \text{ of } \frac{3 \text{ tons } 3 \text{ cwt}}{4 \text{ tons } 3 \text{ cwt}}$ .  
 5. Express  $\frac{2}{5}$  of 7s 6d + 1.25 of 5s - 0.545 of 9s 2d as a decimal of £10.  
 6. Find the cost of 56375 articles at £2 15s 9d per hundred  
 7. A tradesman who commenced business  $5\frac{1}{2}$  years ago increased his capital at the rate of 15 per cent. per annum, simple interest, and it now amounts to £5960. What sum did he start with?

1920.

## ADDITIONAL PAPER.

1 *Esther*, Find the smallest number that must be added to 153 140025 to make it a perfect square

*Or*, A piece of silk cost £84 or 4d, and there were as many yards in the piece as there were pence in the price of a yard. Find the length of the piece

2 *Esther*, The Great Wall of China is said to be 2400 km long and 7625 mm thick at the bottom. Find, to the nearest square foot, the area of the ground it stands upon (1 metre = 39 37 inches.)

*Or*, Employ the contracted method to divide 2 6289475 by 306.5 correct to the sixth decimal place.

1921

## COMPULSORY PAPER

1. Find the continued product of 3781, 3782 and 3783.

2. Add together  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$  and  $\frac{1}{5}$ , subtract the sum from 2, multiply the result by  $\frac{2}{3}$  of  $\frac{27}{40}$  of 8, and find what fraction this is of 99.

3. *Either*, Find the value, correct to 6 places of decimals, of  $2\ 4\dot{1}\dot{8} + 1\ 1\dot{6} + 3\ 0\dot{0}\dot{9} + 0\ 7\dot{3}\dot{5}\dot{4} + 2\dot{4}\ 0\dot{4}\dot{2}$ .  
*Or*, Find the square root of 5345344

4. *Either*, Find the value of 9 yds 2 ft 10 in of cloth 5s.  $7\frac{1}{2}d$  at per yard  
*Or*, What will be the cost of painting a room which is  $20\frac{1}{2}$  ft. long,  $18\frac{1}{2}$  ft. broad and 10 ft. high, containing two windows whose dimensions are 7 ft. by 2 ft. each, at the rate of 2s. 6d. per sq. yd?

5. *Either*, At what rate per cent, simple interest, will £936. 13s. 4d. amount to £1157 7s. 4 $\frac{1}{2}$ d. in  $4\frac{1}{2}$  years?  
*Or*, What sum of money must be left, in order that after a legacy duty of 10 per cent, has been paid, the remainder being lent out at 3 per cent simple interest may give a yearly income of 100 guineas

1922

## COMPULSORY PAPER.

1. Multiply 23405 by 12084.

2. Find the greatest number which exactly divides both 13677 and 28012.

3. A man owns  $\frac{4}{11}$  of a house and  $(\frac{1}{5} + \frac{2}{3})$  of his portion is worth Rs. 112; find the price of the whole house

4. *Either*, Find the cost of 25 bales at Rs. 9. 10a. 7p. per maund if each bale contains 13 mds 24 sr. 12 ch.  
*Or*, Find the cost of making a gravel path 6 ft wide along the inner edge of a square field, whose side is 120 yds long at 8a. per sq. yd

5. *Either*, Extract the square root of 2701.9204.  
*Or*, Find in what time a given sum of money will quadruple itself if lent out at simple interest at the rate of a pice per rupee per month.

1923

## COMPULSORY PAPER.

1. By what number must 695 be multiplied so that when the product is subtracted from one million, the result is 507245?

2. Find the smallest number of which 135, 126, 432, and 255 are divisors.

3. Prove that

$$2 - \frac{4}{9} = \frac{1}{\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}}$$

$$5 - \frac{16}{9}$$

$$7 - \frac{9}{9}$$

4. Either, Add together £3 05425, 12 12 of £2 5s and 7 285714 of a guinea

Or, Find to the nearest pie the value of 1234 maunds, 27 seers, 10 chataks of wheat at Rs 10 $\frac{1}{2}$  8p per maund

5. Either, How often must I run round a square field of 10 acres to run a mile?

Or. A dealer bought 76 cows, and then sold 20 at a profit of 15 per cent, 40 at a profit of 19 per cent and the remainder at a profit of 25 per cent making a total profit of Rs. 657 What did he give for each?

1824

COMPULSORY PAPER.

1. Divide 99790104 by 9987.

Or,

Multiply 771214 by 216636

2. Find the greatest number of six digits which is exactly divisible by 27, 45, 60, 72, 96, and 120.

3. Find the price of 345 maunds, 27 seers, 13 chataks of rice at Rs 10 $\frac{1}{2}$  8p. per maund

Or,

Simplify —

$$\frac{7\frac{1}{2} + 4\frac{1}{2}}{5\frac{1}{4} - 4\frac{1}{2}} = \frac{47\frac{1}{2} + 3\frac{1}{2}}{6\frac{1}{4} - 5\frac{1}{2}} \times \frac{021 \times 0021 \times 210}{14 \times 007}$$

4. A contractor undertakes to dig a canal 12 miles long in 350 days, and employs 45 men, he finds that in 200 days he has completed 4 $\frac{1}{2}$  miles How many additional men must he employ to get the undertaking finished in time?

5. The length of a rectangular field is to its breadth as 3 : 2, and its area is 11,064 sq m. Find the cost of surrounding it with a fence at 2 25 francs per metre length of boundary.

Or,

In an examination 52 per cent of candidates failed in English and 42 per cent in mathematics. If 17 per cent failed both in English and Mathematics, find the percentage of those who passed in both the subjects

## ANSWERS TO EXAMPLES.

### Examples. 1.

1. Ten ; sixteen ; forty-eight ; ninety-nine , seventy-six ; forty-three , fifty , thirty-one ; sixty-two.

2. One hundred , one hundred and eleven ; nine hundred and two , six hundred and twenty ; three hundred , one hundred and three , two hundred and thirty-four , one hundred and thirty

3. Nine thousand, two hundred and sixteen ; five thousand, four hundred and nine , five thousand and four , one thousand and eleven , one thousand, two hundred and ten ; nine thousand ; nine thousand, nine hundred and ninety-nine.

4. Twelve thousand, three hundred and forty-five ; twenty thousand, one hundred and three , forty thousand and forty ; fifty thousand and one ; ninety thousand, six hundred , eighty-nine thousand, three hundred and forty-six.

5. Five hundred thousand , seven hundred and eight thousand, nine hundred ; one hundred and two thousand and thirty ; three hundred and nine thousand, eight hundred and nine , three hundred and seventy-nine thousand, five hundred and eighty-six.

6. Seven million, two hundred and thirty-four thousand, six hundred and fifty-one ; seven million, ninety thousand, seven hundred and nine ; nine million ; seven million, eight hundred thousand and forty , three million, five hundred and sixty-seven thousand, eight hundred and ninety-one.

7. Thirty-two million, five hundred and sixty-seven thousand, eight hundred and ninety-two , thirty-four million, eighty-three thousand and ninety-two ; ninety million, nine thousand ; fifty-five million, five hundred thousand and fifty-five

8. Seven hundred and eighty-nine million, three hundred and forty-five thousand, six hundred and twenty-one ; three hundred and ninety million, eighty-five thousand, two hundred and twenty-two million.

9. Seven thousand and nine million, fifty-six thousand, seven hundred ; three thousand two hundred and fifty-nine million, two hundred and eighty-seven thousand, eight hundred and ninety-one , eight thousand and seventy million, eighty-eight thousand, two hundred

10. Thirty-two thousand and five hundred million ninety-four thousand and one , three hundred and eight thousand five hundred and six million, eight thousand, two hundred and thirty ; one billion, three hundred and fifty-seven thousand nine hundred and

eighty-six million, four hundred and twenty-eight thousand, one hundred and twenty-three.

11. 70, 2 ; 300, 50, 9 ; 4000, 200, 3 ; 70000, 800, 9 ; 1000000000,  
300000000, 400000, 50000, 700, 80, 9 ; 300000000000,  
70000000000, 900000000, 4000000, 70000, 8000, 20, 3.

12. Counting from left, the zeroes respectively indicate the absence of—thousands, tens ; tens of millions, hundreds of thousands, tens of thousands, hundreds, units, tens of thousands of millions, thousands of millions, tens of millions, thousands, tens.

13. (10,000) ten thousand ; (9,999) nine thousand, nine hundred and ninety-nine.

### Examples. 2.

1. 13, 17, 19 ; 12, 11.	2. 23, 34, 40 ; 27.
3. 77, 90, 84, 63.	4. 342 ; 486 ; 504, 900.
5. 203, 430 ; 555 ; 400.	6. 892 ; 704 ; 640 ; 512
7. 7,835, 9,028, 6,009, 4,000 ; 6,085.	
8. 5,992, 8,074 ; 2,003 ; 4,040 ; 3,403	
9. 1,200 ; 80,008 ; 18,454, 36,012, 90,000.	
10. 20,070, 30,008, 54,400 ; 16,004.	
11. 405,000, 800,040 ; 702,074.	
12. 3,000,904 ; 9,000,400, 15,000,050, 100,003,004 ; 4,005,000.	
13. 5,000,700,028 ; 315,764,009,003.	
14. 3,000,000,000,050, 405,000,010,020,007, 1,000,001,001,000 ; 6,000,000,000,006.	
15. 512,255,762,713,473	
16. 12,000,000,000,012 ; 700,000,000,700,700, 3,000,003,003,303.	
17. 7,305,000,502,006,024, 47,000,047,047,047.	
18. 1,000,000, 99,999	

19. The number expressed in figures is 7707, therefore (counting from left), the first boy's mistake consisted in writing three ciphers unnecessarily to the right of the first 7, and two ciphers instead of one to the right of the second 7, the second boy's mistake consisted in omitting to write a cipher to the right of the second 7.

### Examples. 3.

1. Three lacs, forty-five thousand, five hundred and forty-three ; thirty lacs, twenty thousand and fifty ; seventy-nine lacs, ninety

thousand, five hundred and seventy ; seventy lacs, fifty thousand, three hundred and four

2 One crore, twenty-three lacs, forty-five thousand, six hundred and seventy-eight ; thirty crores, fifty-seven lacs, fifty thousand and eighty , four crores, fifty lacs

3 Twenty-three crores, seventy-eight thousand and one , seven hundred and eight crores, nine lacs, four thousand and eighty , three hundred and seventy-nine crores, forty-eight lacs, fifty-seven thousand, six hundred and twelve

4. Eight hundred and twenty-seven crores, forty lacs, fifty-seven thousand and nine ; three hundred and fifty crores, one thousand, two hundred and thirty ; three hundred and ten crores, thirty-seven lacs, five thousand and forty.

5 One hundred and twenty-three crores, forty-five lacs, sixty-seven thousand, eight hundred and ninety , six hundred crores, seven lacs, eighty-nine thousand , five hundred and one crores, seven lacs, two thousand and nine

6. 1,14,000 , 78,00,000 ; 15,04,030 , 7,00,007.

7. 1,00,00,500 , 28,03,00,004 , 20,00,00,000 , 1,01,01,001.

8. 300,05,04,000 ; 101,01,00,101.

9 328,17,45,715 10 705,17,24,736.

11 One hundred thousand , ten lacs ; ten million.

12.  $103,07,00,704 = 1,030,700,704$  which is read—ten crores, thirty lacs, twenty-eight thousand, four hundred and one.

13  $103,07,00,704 = 1,030,700,704$  which is read—one thousand and thirty million, seven hundred thousand, seven hundred and four

#### Examples. 4.

1. 6	2. 9.	3. 49	4. 99	5. 75.
6. 264.	7. 609	8. 664,	9. 1990.	10. 60010.
11. 2764.	12. XLIV.	13. LXVI.	14. LXXIX.	
15. LXXXIII.	16. CXLIX		17. CDXXXVI	
18. CMXC	19. MCCCLII.		20. $\overline{V}DCLXX.$	
21. MMMCXLIX.	22. $\overline{XL}VCMLXXVIII.$		23. $\overline{M}.$	

#### Examples. 5.

1. 21.	2. 30.	3. 31.	4. 29.	5. 34.
6. 98.	7. 99.	8. 77.	9. 140.	10. 163.

11. 1323. 12. 1151. 13. 792 14. 2727. 15. 2000.  
 16. 14129. 17. 9996. 18. 3674. 19. 5620. 20. 4696.  
 21. 146175. 22. 59038. 23. 234671. 24. 379462.  
 25. 45271. 26. 2262514. 27. 920114. 28. 982255.  
 29. 7474095. 30. 39679341. 31. 42450564. 32. 496651.  
 33. 92439. 34. 8082862. 35. 931979. 36. 531284.  
 37. 5694685. 38. 311989. 39. 9925098. 40. 984610763.  
 41. 74307. 42. 10246451. 43. 765168567. 44. 3129223218.  
 45. 46451330. 46. 3936. 47. 1890. 48. 365.  
 49. 741. 50. 2040. 51. 138187. 52. 42004 rupees.  
 53. 7193165 maunds. 54. 1468. 55. 163554.

## Examples. 6.

1. 43. 2. 52 3. 222. 4. 543. 5. 4321.  
 6. 25. 7. 49 8. 8. 9. 9. 10. 33.  
 11. 189. 12. 90. 13. 178. 14. 459. 15. 315.  
 16. 4641. 17. 47017. 18. 30532. 19. 27273. 20. 41976.  
 21. 2679. 22. 689357. 23. 687590. 24. 735347.  
 25. 6499247. 26. 5546. 27. 85416. 28. 707467.  
 29. 3562. 30. 1. 31. 688881. 32. 390794.  
 33. 61059. 34. 999981 ; 999695 ; 990525 ; 900554 , 956500.  
 35. 92964. 36. 99971. 37. 9998999. 38. 9921.  
 39. 83 years. 40. In 1642. 41. 923. 42. 117681 rupees.  
 43. 325 rupees. 44. 9460 rupees. 45. 16516.  
 46. 777101. 47. 6390. 48. 2000.  
 49. 35242 rupees. 50. 30000600. 51. 4503600.

## Examples. 7.

1. 458. 2. 62784. 3. 2740. 4. 288. 5. 19835.  
 6. 970. 7. 9960. 8. 14006. 9. 92788. 10. 99803.

## Examples. 8.

1. 46. 2. 96. 3. 84. 4. 195. 5. 282.  
 6. 522. 7. 784. 8. 684. 9. 765. 10. 987.  
 11. 2835. 12. 7911. 13. 19470. 14. 35445.  
 15. 73648. 16. 315824. 17. 623245. 18. 769527.

19. 68158 ; 102237 ; 136316 ; 170395 ; 204474 ; 238553 ; 272632 ;  
 306711. 20. 3625.

Examples. 9.

1. 10770. 2. 281400. 3. 195250. 4. 421800. 5. 35100.  
 6. 5760300. 7. 24040000. 8. 81036000. 9. 183018000.  
 10. 656550 ; 5836000 ; 51065000 ; 437700000 ; 3647500000.

Examples. 10.

1. 20250.	2. 88592.	3. 51060.	4. 1715340.
5. 7920848.	6. 7845984.	7. 501264.	8. 2877420.
9. 41269151.	10. 712823175.	11. 546962350	
12. 8741795904.	13. 60956040000.	14. 73866065616.	
15. 4278833730.	16. 7716453390592.	17. 22237262250000.	
18. 389341782447	19. 2993392500000.	20. 8784920736579.	
21. 2247882292480.	22. 27706959000.	23. 62834211900	
24. 581199247904.	25. 10612283522500.	26. 234916991512.	
27. 83779349418000.	28. 47619	29. 45708.	
30. 93652	31. 99148.	32. 73350.	33. 140624.
34. 230690.	35. 505260.	36. 82764.	37. 711360.
38. 2170671.	39. 316875 rupees.	40. 10727350.	
41. 20692 maunds.	42. 33114.	43. 3744.	

Examples. 11.

1. 432.	2. 4720645.	3. 16905000.	4. 1905700.
5. 1153800.	6. 44274384.	7. 1314.	8. 86400.
9. 3200.	10. 399735.	11. 9425.	12. 2208.

Examples. 12.

1. See the Multiplication Tables.  
 2. 576. 3. 2500. 4. 4624. 5. 10000.  
 6. 12544. 7. 61504. 8. 531441. 9. 763876.  
 10. 1 ; 8 ; 27 , 64 ; 125 ; 216 ; 343 ; 512 ; 729 ; 1000 ; 1331 ; 1728 ;  
 2197 ; 2744 , 3375 ; 4096 , 4913 ; 5832 ; 6859 ; 8000.  
 11. 804357. 12. 1000000. 13. 679151439.  
 14. 170953875. 15. 29503629. 16. 62913.

## Examples. 13.

1. 188.	2. 4617.	3. 3542, rem. 1.
4. 2333, rem. 1.	5. 2675.	6. 30042.
7. 20511, rem. 1.	8. 8203, rem. 1.	9. 11419, rem. 2.
10. 2469	11. 20040.	12. 15555, rem. 2.
13. 15067, rem. 1.	14. 14557, rem. 3.	15. 13155, rem. 4.
16. 541, rem. 2.	17. 6569, rem. 3.	18. 4640
19. 4809, rem. 2.	20. 4313, rem. 5.	21. 2005, rem. 2.
22. 8013, rem. 7.	23. 10000, rem. 1.	24. 8666, rem. 6.
25. 5897, rem. 2.	26. 2456.	27. 3200
28. 7070, rem. 7.	29. 2440, rem. 2.	30. 3004, rem. 8.
31. 1498, rem. 8	32. 1947, rem. 4.	33. 2002, rem. 4.
34. 169, rem. 29.	35. 11404, rem. 22.	36. 135, rem. 30.
37. 407, rem. 80	38. 521, rem. 89.	39. 87, rem. 300.
40. 694, rem. 2	41. 48, rem. 101.	42. 45, rem. 254.
43. 160, rem. 289	44. 58, rem. 356.	45. 44, rem. 357.
46. 453, rem. 219.	47. 706, rem. 354.	48. 112, rem. 4543.
49. 234, rem. 641.	50. 3263, rem. 931.	51. 1017, rem. 2556.
52. 381, rem. 1664	53. 2559, rem. 2316	
54. 6652, rem. 5423.	55. 114285, rem. 3351.	
56. 1250, rem. 539	57. 15200, rem. 10321.	
58. 15005, rem. 54720.	59. 1338, rem. 110580.	
60. 423297, rem. 37606.	61. 240100, rem. 117400.	
62. 420, rem. 114903	63. 63261, rem. 6731383.	
64. 8425323113, rem. 75.	65. 9886426883, rem. 672.	
66. 507.	67. 36.	68. 528 times.
70. 229 times.		69. 13.
73. 375 rupees.		71. 30115.
		72. 7674.
		74. 256 days.
		75. 22.

## Examples. 14.

1. 17280, rem. 1.	2. 26310.	3. 20089, rem. 2.
4. 2558, rem. 2.	5. 3842, rem. 5.	6. 14057, rem. 1.
7. 4320, rem. 7.	8. 2207, rem. 7.	9. 3456, rem. 7.
10. 52731, rem. 5.	11. 67253, rem. 4.	12. 10437, rem. 8.
13. 32198, rem. 10.	14. 49538, rem. 10.	15. 58491, rem. 6.

16. 228850, rem. 7. 17. 455961, rem. 7. 18. 649772, rem. 10.  
 19. (i) 1728394, rem. 1, 1152263, 864197, rem. 1; 691357, rem. 4;  
       576131, rem. 3; 493827; 432098, rem. 5; 384087, rem. 6;  
       345678, rem. 9; 314253, rem. 6, 288065, rem. 9,  
       265906, rem. 11; 246913, rem. 7; 230452, rem. 9,  
       216049, rem. 5; 203340, rem. 9; 192043, rem. 15,  
       181936, rem. 5; 172839, rem. 9.  
 (ii) 40352015, 26901343, rem. 1; 20176007, rem. 2; 16140806;  
       13450671, rem. 4; 11529147, rem. 1; 10088003, rem. 6;  
       8967114, rem. 4, 8070403, 7336730; 6725335, rem. 10;  
       6208002, rem. 4; 5764573, rem. 8; 5380268, rem. 10;  
       5044001, rem. 14; 4747295, rem. 15; 4483557, rem. 4;  
       4247580, rem. 10; 4035201, rem. 10.  
 (iii) 493827160, rem. 1; 329218107, 246913580, rem. 1;  
       197530864, rem. 1; 164609053, rem. 3; 141093474, rem. 3,  
       123456790, rem. 1; 109739369; 98765432, rem. 1,  
       89786756, rem. 5; 82304526, rem. 9; 75973409, rem. 4;  
       70546737, rem. 3, 65843621, rem. 6; 61728395, rem. 1;  
       58097313; 54869684, rem. 9; 51981806, rem. 7,  
       49382716, rem. 1.

**Examples. 15.**

1. 210.	2. 465.	3. 1035.	4. 2850
5. 5050.	6. 1254.	7. 3315.	8. 15150.
9. 245.	10. 44818	11. 4568.	12. 37951.
13. 4628 and 3899.		14. 5444 and 4556.	

**Examples. 16.**

1. 17472.	2. 337050.	3. 672840.	4. 132624.
5. 244160	6. 94976.	7. 2599400.	8. 601425.
9. 1233282.	10. 143472.	11. 446048.	12. 3532008.
13. 295100780.	14. 1220242681.	15. 3625.	16. 1645.
17. 4060.	18. 2100	19. 18225.	20. 2300.
21. 12250.	22. 15625.	23. 25875.	24. 11088.
25. 281718.	26. 2039796.	27. 420158.	28. 4182640.
29. 8267519.	30. 36950.	31. 5565.	32. 31220.

33. 53175.	34. 4560	35. 59175.	36. 1225.
37. 3025.	38. 7396	39. 9409.	40. 105625.
41. 216225.	42. 606841	43. 802816.	

## Examples. 17.

1. 39	2. 23.	3. 42	4. 68.	5. 23
6. 330, rem. 24.		7. 540, rem. 40.		8. 372, rem. 20.
9. 755, rem. 84.		10. 677, rem. 117.		11. 2935, rem. 168.
12. 12882, rem. 58.		13. 359, rem. 319.		14. 2057, rem. 294.
15. 1422, rem. 138		16. 389, rem. 4		17. 34, rem. 56.
18. 89, rem. 345.		19. 827, rem. 46.		20. 89, rem. 346.
21. 12, rem. 3456.		22. 129, rem. 22		23. 157, rem. 42.
24. 123, rem. 67.		25. 38, rem. 1368.		26. 46, rem. 894.
27. 783, rem. 10743.		28. 122, rem. 893.		29. 9733, rem. 176.
30. 2716, rem. 187.		31. 75, rem. 3.		32. 937, rem. 4.
33. 255, rem. 1		34. 313, rem. 20.		35. 3316, rem. 19.
36. 5515, rem. 17.		37. 670, rem. 14.		38. 1103, rem. 16.
39. 30, rem. 42.		40. 24, rem. 14		41. 22, rem. 19.
42. 20, rem. 21.		43. 16, rem. 34.		44. 21, rem. 29.
45. 108, rem. 66.				

## Examples. 18.

1. 2195.	2. 75582.	3. 871882.	4. 304166.	5. 18776.
6. 85040.	7. 1595.	8. 8832.	9. 92080.	10. 45138.
11. 49, rem. 74.		12. 118, rem. 53.	13. 113, rem. 79.	
14. 2012, rem. 284.	15. 1064, rem. 3045.		16. 866, rem. 2377.	

## Examples. 19.

1. 2771928	2. 7386918.	3. 3747321.
4. 94876320.	5. 627399162.	6. 222013980.
7. 153660000.	8. 313199250.	9. 6783119796.

## Examples. 19a.

1. 14.	2. 6.	3. 2.	4. 3.	5. 20.
6. 4.	7. 31.	8. 2.	9. 2	10. 28.
11. 4.	12. 14.	13. 0.	14. 10.	15. 450.
16. 14.	17. 83.	18. 65.	19. 200.	20. 0.

## Miscellaneous Examples. 20

1	2548	2	2022	3	8611	4	621.	5	788
6	9001	7	316	8	11	9	3721	10.	17
11	1477	12	6354	13	33794	14	459101		
15	40023 times, rem 21	16		532		17.	176	18	34.
19	150, 83	20	7 times	21	1545	22	159943		
23	89	24	362	25	514590	26	99 and 106.		
27.	23 years	28	176913	29	189461.	30.	71265		
31.	615	32	134807	33	545 pice	34	812168364		
35.	313288352	36	475 rupees	37	<i>A</i> , 58, <i>B</i> , 34, <i>C</i> , 42				
38.	<i>A</i> , 40 rupees, <i>B</i> , 39 rupees, <i>C</i> , 30 rupees.	39		39	135 rupees				
40	18 per rupee	41	60 seers; 100 seers	42.	1800 rupees				
43	5 years	44	10 years; 70 years	45.	60	46	46	3 P.M	

## Examples 21.

1.	624a	2	1664a	3	115328a.	4.	59168a
5	121a	6	372a	7	604a	8	830a
9	59328p	10	14208cp	11	653184p.	12	38700p
13.	21624p	14	135324p	15	5187p	16	7641p
17	13055p	18	194 pice; 582p		19.	501 pice, 1503p	
20.	635 pice, 1005p	21.	7410	22	1632.	23	631.
24.	100	25	3896	26	482	27.	14400s
28	4800s	29	14180s	30	6100s.	31.	405s
32	532s	33	617s	34	719s.	35.	8400d
36.	160800d	37	1684800d	38	10932d	39.	12156d
40	18420d	41	870d	42	2170d	43	1883d
45	2936167	46	7332q.	47.	3229q	48	6758q
49	2691q	50	37 crowns; 370 sixpences; 555 fourpences				
51.	42 crowns; 420 sixpences, 630 fourpences.						
52.	63 crowns, 630 sixpences, 945 fourpences.						
53.	19 half-crowns	54.	255 threepences		55.	36000q.	
56.	28224 half-pence	57	100 oranges.	58.	2286 farthings.		
59.	125 books	60.	55 children.	61.	396 beggars		

## Examples. 22.

1. R52. 1a. 4d.	2. R160 6a 1d.	3. R405. 1a. 1d.
4. R20 9a.	5. R40 11a. 11d.	6. R57 13a. 11d.
7. R157. 13a 3d.	8. R247. 4a. 2d.	9. R52. 1a 5d.
10. R15 10a.	11. R59 2a 3d.	12. R48 2a 6d.
13. R55. 5a. 3d	14. R69 13a	15. R120.
16. £1. 11s. 4d.	17. £29 5s. 3d	18. £37 3s. 4d.
19. £1. os. 10d.	20. £10. 8s 6d	21. £3. 9s. 5½d
22. £8 7s 6d.	23. £8 5s 2½d.	24. £4 11s. 10d.
25. 15s. 9½d.	26. £49. 5s.	27. £28. 7s.
28. £48. 15s.	29. £9 18s	30. £40. 10s.
31. R15.	32. R4. 11a.	33. 15s.

## Examples. 23.

1. R1. 11a. 2 pice.	2. R2 14a. 1 pice.	3. R3. 1a 1 pice.
4. R2. 9a. 2 pice.	5. R2 9a	6. R2. 15a.
7. R3. 0a. 3d.	8. R2. 14a 6d	9. R52. 12a. 9d.
10. R85. 12a. 10d.	11. R82. 9a	12. R518 2a.
13. R1888	14. R1380. 11a. 4d.	15. R1973. 14a. 7d.
16. R4657 1a 5d	17. R17776. 6a 10d.	18. R23930 10a 1d.
19. R23805. 12a. 7d.	20. R22221. 3a. 6d.	21. £509. 1s. 5d
22. £470 19s	23. £1010 5s. 9d	24. £10103 os 8½d.
25. £5746. 19s 9½d.	26. £466 12s. 3½d.	27. £877 17s 5½d.
28. £850. 6s 4½d.	29. £1758 17s. 2½d.	

## Examples. 24.

1. R6. 3a 1 pice	2. R41 12a. 3 pice.	3. R9 10a 3 pice
4. R3 11a 9d	5. R39. 14a 9d.	6. R9 8a 4d.
7. R15. 3a. 5d.	8. 13a. 9d.	9. R10. 8a 10d.
10. R58. 3a. 8d.	11. R273 13a. 11d.	12. 6a. 6d.
13. £5 9s. 7d.	14. £13 15s. 8½d.	15. £20. 18s 8½d.
16. £2 12s. 4½d.	17. £2 3s. 3½d.	18. £11. 12s 8½a
19. £7. 15s. 1¼a.	20. £2. 7s. 1½d.	21. £30. 14s 9½d
22. £809 6s. 9½d.	23. £467 4s. 11½d.	24. £118. 18s. 5½d

## Examples. 25.

1. R10. 10a. 1 pice, R17. 11a 3 pice, R24. 13a. 1 pice.
2. R48. 14a. 6p., R68 7a. 6p., R88. 0a. 6p.
3. R439. 4a. 1p.; R519. 1a 11p.; R638. 14a. 8p.
4. £89. 16s. 3d., £209. 11s. 3d., £269 8s 9d.
5. £226. 12s. 4½d., £302 3s. 2d., £491. 0s. 1½d.
6. £201. 19s. 4½d.; £363. 10s. 10½d., £484. 14s. 6d.
7. R47. 14a 2 pice, R73, R57. 0a 2 pice.
8. R2228. 10a.; R3939. 14a. 3p., R3979. 11a
9. R6106. 12a. 4p., R5911. 5a. 8p., R7035.
10. £2819. 19s 7½d., £2228. 2s 8d., £27851. 13s. 4d.
11. £4816. 13s. 2½d., £3503 os. 6d., £20434. 6s. 3d.
12. R1. 14a. 13. R126. 14. £10. 2s. 6d. 15. £37. 14s 2d
16. R5468 12a. 17. £266. 17s. 6d. 18. R10031. 4a.

## Examples. 26.

1. R75. 7a. 2 pice; R121. 6a. 2 pice.
2. R288. 7a. 9p.; R366. 7a. 3p. 3. R1618. 3a. 6p.; R2766.
4. R6015. 3a. 9p.; R8490. 7a 6p. 5. £2235. 12s. 6d.; £490.
6. £12763. 10s. 6d., £4285. 13s 9½d.
7. £4934. 10s. 0½d.; £5432. 10s. 9½d.
8. £7783. 18s. 10½d.; £8624. 13s. 10½d.
9. R2754. 9a. 9p. 10. R1799. 12a. 9p.

## Examples. 27.

1. R3. 2a. 1 pice. 2. R4. 13a. 3 pice. 3. R7. 7a. 7p.
4. R10. 12a. 4p. 5. R12. 13a. 1p. 6. R5. 15a. 3p.
7. R15. 5a. 3p. 8. R10. 1a. 11p. 9. £3. 7s. 2½a.
10. 11s. 3½d. 11. £55. 12s. 9½d. 12. £53. 18s. 7½d.
13. £3. 7s. 10½d. 14. £2. 7s. 1½d. 15. R6. 15a. 10p.
16. R56. 7a. 5p. 17. R145. 12a. 6p. 18. R143. 15a. 2p.
19. R41. 3a. 5p. 20. R138. 2a 8p. 21. £9. 15s. 10½d.
22. £55. 13s. 2½d. 23. £47. 7s 1½d. 24. £420. 2s. 3½d.
25. R1. 2a. 5p. 26. R3 4a. 3p. 27. R5 12a. 4p.
28. R12. 10a. 5p. 29. £125. 15s. 9½d. 30. £12. 18s. 10d
31. 3a. 9p. 32. 10 annas 33. 2a. 8p. 34. 3s. 6d.

## Examples. 28.

1. R13. 9a. 3p.	2. R37 9a. 10p.	3. R2. 12a. 9p.
4. R12 7a. 4p.	5. R40. 10a 10p.	6. R61. 10a 1p.
7. 3a 3p.	8. R2 2a. 2p.	9. £43. 16s. 8d
10. £22 15s. 8d.	11. £5 2s 2 $\frac{1}{2}$ d	12. £3 0s. 1 $\frac{3}{4}$ d

## Examples. 29.

1. R5 1a. 1p	2. R4. 15a 7p. or 8p.	3. R1. 10a. 6p.
4. R3. 4a 5p	5. R7. 10a. 2p	6. R3 15a 2p.
7. R10 13a 10p	8. R9 3a 10p	9. £5. 11s 6 $\frac{3}{4}$ d
10. £4. 5s. 10d.	11. £11. 10s 3 $\frac{1}{2}$ d	12. £4 19s. 9d.
13. £2 13s 1 $\frac{1}{2}$ d	14. £2 18s 5 $\frac{1}{2}$ d	
15. R204 11a, rem 8p	16. R143 8a. 9p, rem 38p.	
17. R65. 8a. 3p, rem 15p	18. R98 12a 2p, rem. 989p.	
19. £14 10s 6d, rem 6d.	20. £127 16s 2d, rem. 23od.	

## Examples. 30

1. 9 2 15.	3 24	4 21	5. 56
6. 28, rem. R2 11a 6p.	7. 21, rem R3 7a 4p.		
8. 40, rem. R3. 1a 9p	9 32, rem. £18. 3s. 3d.		
10. 102, rem. £8. 3s 4 $\frac{1}{2}$ d.	11 57	12. 184.	
13. 300. 14. 3426.	15. 7 days	16. 100.	

## Examples. 31.

1. 1192320 gr.	2. 170880 gr.	3. 21927 gr.
4. 165000 gr	5. 319896 gr	6. 41865 gr
7. 1 lb 4 oz 6 dwt 21 gr.	8. 1 lb 6 oz 11 dwt 19 gr.	
9. 10 lb 0 oz 12 dwt. 4 gr.	10. 17 lb 4 oz 6 dwt. 16 gr.	
11. 2 lb 3 oz 0 dwt 23 gr.	12. 3 lb 0 oz. 9 dwt 9 gr.	
13. 24 lb. 6 oz. 8 dwt. 13 gr.	14. 2 oz 16 dwt 22 gr.	
15. 2 lb 6 oz. 14 dwt. 8 gr.		
16. 1 lb 4 oz 8 dwt 8 gr. ; 8 lb. 9 oz. 1 dwt. 8 gr. ;		
116 lb 9 oz 19 dwt. 16 gr.		
17. 8 oz 6 dwt. 16 gr ; 20.	18. 4 lb 9 oz.	
19. 3 dwt. 18 gr	20. 34.	

## Examples. 32.

1. 4386816 dr.      2. 1218560 dr.      3. 2005392 dr.
4. 5361664 dr.      5. 1240064 dr.      6. 84156 dr.
7. 1 ton 14 cwt. 3 qr. 14 lb. 3 oz. 15 dr.
8. 4 cwt 1 qr. 6 lb. 4 oz.      9. 12 lb. 6000 gr.
10. 63775 tons 10 cwt. 0 qr. 22 lb. 6000 gr
11. 38 lb. 1 oz. 6 dr.      12. 14 cwt. 3 qr. 26 lb. 8 oz.
13. 11 tons 9 cwt. 3 qr. 4 lb.      14. 3 lb. 4 oz. 6 dr.
15. 6 tons 8 cwt. 2 qr. 18 lb
16. 2 tons 15 cwt 0 qr. 3 lb. 15 oz. 14 dr. , 34 tons 11 cwt. 3 qr. 14 lb. 3 oz ; 129 tons 6 cwt. 2 qr. 19 lb 10 oz. 2 dr.
17. 1 cwt. 2 qr. 27 lb. 5 oz. ; 500.
18. 2 tons 1 cwt. 3 qr. 11 lb. 8 oz.      19. 2 cwt. 2 qr. 2 lb.
20. 768      21. A pound of feathers is heavier by 1240 grains.
22. 175 lb. Troy.

## Examples. 33.

1. 8140 kanchas ; 10175 tolas.      2. 6448 kanchas ; 8060 tolas.
3. 4796 kanchas ; 5995 tolas.      4. 6176 kanchas ; 7720 tolas.
5. 2288 kanchas ; 2860 tolas.      6. 7040 kanchas ; 8800 tolas.
7. 1 md. 32 seers 14 ch.      8. 1 md. 12 seers 1 ch. 1 kancha.
9. 12 md. 18 seers 3 ch.      10. 31 md. 10 seers.
11. 31 md. 13 seers 13 ch.      12. 41 md. 13 seers 7 ch.
13. 81 md. 12 seers 1 ch. 1 kancha.      14. 4 md. 27 seers 13 ch
15. 7 md. 31 seers 10 ch. 2 kanchas.
16. 1 md. 11 seers 0 ch. 3 kanchas ; 5 md. 38 seers 3 ch. 2 kanchas ; 305 md. 11 seers 8 ch. 3 kanchas.
17. 39 seers 1 ch. ; 25.      18. 595 md. 2 seers 3 ch.
19. 1 seer 2 kanchas.      20. 640.      21. 18900.      22. 75.

## Examples. 34.

1. 20 tolas.      2. 2280 tolas.      3. 3816 tolas.
4. 6792 tolas.      5. 45120 tolas.      6. 72600 tolas.
7. 5 can. 7 md. 1 seer.      8. 16 md. 1 viss 2 seers 6 poll.
9. 3 can. 12 md. 7 viss 1 seer 5 poll. 1 tola.

10. 4 can. 16 md. 3 viss 2 seers 2 poll. 2 tolas  
 11. 2 viss 2 seers 4 poll                    12. 1 can 8 md. 7 viss.  
 13. 86 can. 5 md                            14. 4 md 3 viss 3 seers 6 poll.  
 15. 11 can 14 md 1 viss 1 seer 6 poll  
 16. 1 can 3 md 2 viss 2 seers 6 poll, 11 can. 19 md 6 viss  
       4 seers, 38 can 9 md 4 viss 6 poll  
 17. 12 md 4 viss, 40.                    18. 15 can 13 md 1 viss 24 poll.  
 19. 1 md 1 viss 1 seer 1 poll            20. 960.                    21. 4375.

## Examples 35

1. 73728000 dhans.    2. 801792 dhans    3. 756608 dhans.  
 4. 23224320 dhans    5. 31488 dhans    6. 1257984 dhans.  
 7. 1 can. 33 seers 24 tanks    8. 1 can 7 md 12 seers 1 tank.  
 9. 18 md 39 seers 39 tanks 2 mashas  
 10. 135633 can 13 md 24 seers 32 tanks  
 11. 2 md 3 seers 22 tanks 2 mashas  
 12. 2 can 5 md. 37 seers 11 tanks  
 13. 12 can. 3 md 14 seers 36 tanks  
 14. 3 can 3 md 32 seers 59 tanks  
 15. 7 can 8 md 10 seers 3 tanks  
 16. 16 md 36 seers 53 tanks ; 6 can. 1 md 32 seers 36 tanks ;  
       39 can 1 md 25 seers 15 tanks  
 17. 3 md 32 seers 56 tanks ; 400            18. 18 can 8 md 9 seers  
 19. 1 md. 1 seer 1 tank                    20. 6400

## Examples. 36

1. 4500 in    2. 39600 in    3. 190080 in    4. 380160 in  
 5. 182556 in.    6. 209880 in    7. 612018 in    8. 762 in  
 9. 1110 in    10. 1467 in    11. 184878 in    12. 431766 in  
 13. 28 po 2 yd    14. 36 po 4 yd    15. 19 po 2 yd 1 ft 6 in  
 16. 35 po 3 yd 1 ft 6 in    17. 6 po 1 yd 10 in.  
 18. 1 mi 36 po 5 yd 1 ft    19. 1 mi 1 fur 9 po 4 yd 6 in  
 20. 1 mi 2 fur 4 po 2 ft 5 in    21. 5 po. 10 in  
 22. 1 mi. 7 fur 6 po 1 ft    23. 3 mi 5 fur 24 po 3 yd 2 ft 3 in.  
 24. 15 mi 4 fur 28 po 2 ft 6 in    25. 504 in    26. 63 in.  
 27. 126 in.    28. 100 nails    29. 44 nails.    30. 50 ells.    31. 8000.

## Examples. 37.

1. 29808 sq. in.
2. 4704480 sq. in.
3. 752716800 sq. in.
4. 8028979200 sq. in.
5. 47358432 sq. in.
6. 80760240 sq. in.
7. 7880004 sq. in.
8. 127692 sq. in.
9. 200196 sq. in.
10. 300384 sq. in.
11. 17546220 sq. in.
12. 22632732 sq. in.
13. 12 sq. po. 2 yd.
14. 24 sq. po. 14 yd.
15. 32 sq. po. 3 yd.
16. 33 sq. po. 1 yd. 6 ft. 108 in.
17. 1 ac. 2 ro. 18 po. 19 yd. 4 ft. 72 in.
18. 7 ac. 3 ro. 10 po. 8 yd. 4 ft. 72 in.
19. 2 ac. 23 po. 8 yd. 2 ft. 36 in.
20. 2 ac. 2 po. 25 yd. 3 ft. 72 in.
21. 5 sq. yd. 5 ft. 34 in.
22. 2 sq. po. 3 ft. 94 in.
23. 25 sq. po. 5 yd. 7 ft. 62 in.
24. 1 ac. 2 ro. 11 po. 28 yd. 51 in.
25. 4390848 sq. in.
26. 48400 sq. yd.

## Examples. 38

1. 23280 ga.
2. 4025 ga.
3. 42140 ga.
4. 124000 ga
5. 6399 ga.
6. 101100 ga.
7. 1 bi. 6 cot. 15 ch.
8. 2 cot. 4 ch. 8 ga
9. 1 bi. 4 cot. 10 ch. 12 ga.
10. 1 bi. 11 cot. 4 ch.

## Examples. 39.

1. 139968 cu. in.; 326592 cu. in., 559872 cu. in.; 746496 cu. in.; 933120 cu. in., 1819584 cu. in.
2. 2 cu. yd. 17 ft. 768 in.; 21 cu. yd. 4 ft. 966 in.

## Examples. 40.

1. 404 gills
2. 2816 gills.
3. 1504 gills.
4. 1696 gills.
5. 9344 gills.
6. 18176 gills.
7. 159744 gills.
8. 50432 gills.
9. 428032 gills.
10. 31 gall. 1 qt.
11. 1 barrel 28 gall. 3 qt. 1 gall.
12. 2 barrels 34 gall. 1 qt.
13. 6 barrels 9 gall. 3 qt. 1 gall.
14. 1 qr. 3 bus. 2 pk. 1 gall. 3 qt.
15. 5 bus. 3 pk. 3 qt. 1 pt.
16. 1 last 2 qr. 1 bus. 2 pk. 1 gall. 1 qt.
17. 4 lasts 1 ld. 3 qr. 1 bus. 3 pk. 1 qt. 1 pt. 1 gall.
18. 25 lb. Avoir.
19. 3500 lb. Avoir.
20. 64; 32.

## Examples. 41.

1. 25923 sec.	2. 637800 sec	3. 1512000 sec.
4. 1 hr 23 min. 20 sec.	5. 1 da 3 hr. 26 min. 5 sec	
6. 1 da. 3 hr 46 min. 40 sec.	7. 1 wk 4 da 13 hr. 46 min. 40 sec.	
8. 94.	9. 121.	10. 244.
11. 577.		
12. 289.	13. 821	14. Thursday.
		15. Wednesday

## Examples. 42.

1. 26247".	2. 865535".	3. 1296000".
4. 1°. 6'. 40".	5. 10° 32'. 36".	6. 1 rt gle 26°. 40'.
7. 1 rt. gle. 47°. 36'.		8. 3 rt. gle. 4°. 20'. 54".

## Examples. 43.

1. 24000.	2. 104 reams 3 quires 8 sheets.	3. 432.
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## Examples. 44.

1. 1120 gr.	2. 1632 gr.	3. 24960 m.
4. 192000 m.	5. 612309 m.	

## Miscellaneous Examples. 45.

1. 61200	2. R19 13a 6p	3. £569. 1s 7½d
4. 479 mi 2 fur	5. R13 3a	6. 2028.
7. 1a 4d 8. 1s. 9½d 9	10. 105 parcels, 30 seers rem.	
11. 96 12. 1920 13	11 14 R188. 11a 9p	
15. R12 15a. 6p	16. R48 14a 9p, R343. 6a 3p.	
17. R2 10a 3p	18. R500 13a 9p	19. £1 1s. 11d.
20. R5 1a	21. R3754 9a 9p.	22. 6s 3d
23. 56 yr 3 mo 7 da	24. 160	25. 5 sec.
26. 3960 27 2 ft 7 in	28. 4196	29. R83 12a.
30. R32 11a 9p. 31. £66 12s 6d 32	17. 38. R687 10a.	
34. £30 5s 1½d 35. £66 13s 4d 36	104. 37. 53.	
38. 130 lb 39. 16 yr 4 mo 2 da	40. 4s 2d 41. 2s. 6d.	
42. 62. 43. 12 seers 44. 5 md.	45. 8 min 18 sec.	
46. 5 ft. 4 in. 47. 16th September. 48. Friday the 8th of May.		
49. 53 hours. 50. 192000 miles per sec.	51. 68. 52. 19.	

53. 3 yd. 54. R2. 3a. 55. 11088. 56. 4497 times.  
 57. 18000. 58. R2745. 59. 41 yd. 4 in. 60. 28 yr. 13 wk. 4 da.

Examples. 46.

1. 84. 2. 44. 3. 5a.  
 4. Receives £13 13s. 9d. 5. R1. 7a 3d

Examples. 47.

1. Gains R2. 8a. 2. R21. 1a. 6d. 3. R30. 4. R7. 12a.  
 5. R30. 7a 6d. 6. R1. 10a. 3d. 7. 3d. 8. 4d  
 9. £1. 1s. 10. 24 qr 11. 8s. 4d. per yard.  
 12. R1. 5a. per lb. 13. Gain 12s. 6d. 14. 4d.  
 15. (i) R1. 2a. ; (ii) R1. 3a.

Examples 48.

1. 4a. 2d. 2. £1. 4s 3. 15a. 4. R9. 6a. 5. 2s. 3d  
 6. 2s. 3d. 7. 2d 8. 6 seers. 9. 9 lb. 10. 2s. 6d

Examples. 49.

1. A, R23. 6a. , B, R16 1a. 9d.  
 2. A, £12. 6s. 7½d , B, £16 or 10½d.  
 3. The two get R34 3a 1d each ; the rest R22. 4a 4d. each.  
 4. Each man, R20 4a 6d ; each woman, R26. 4a. 6d.  
 5. A, R16. 6a. 10d. ; B, R13 6a. 10d. ; C, R9. 6a. 10d.  
 6. A, R113. 13a. 3d. , B, R106 13a. 3d. , C, R108. 13a. 3d.  
 7. £40.

Examples 50

1. Boy, R10 6a. 4d. ; girl, R5 3a 2d.  
 2. A's share=R15. 9a 6d. , B's=R10 6a 4d. , C's=R5. 3a. 2d  
 3. Each man, R12. 8a , each woman, R6 4a. , each boy, R3. 2a  
 4. A, £6. 14s 6d. ; B, £3 7s 3d. , C, £1. 13s. 7½d  
 5. One gets £5 3s. 9d , and the other two, £2 11s. 10½d. each.  
 6. A, R26 15a. 3d. ; B, R12 8a 6d.

Examples. 51.

1. 12. 2. 10. 3. 12. 4. 16  
 5. 11 rupees; 22 half-rupees, 44 quarter-rupees. 6. 32

### Examples. 52.

1. R3. 7a. 9p. 2. R10. 2a.  
 3. The price of a horse is R75. 8a, of a cow, R25. 8a.  
     and of a sheep, R5. 8a.  
 4. A mark = 11 $\frac{3}{4}$ d., a gulden = 1s. 11 $\frac{3}{4}$ d.; a rouble = 3s. 1 $\frac{1}{2}$ d.  
 5. R38. 4a. 6p.

### Examples. 53.

1.	2, 3	2	3, 5, 9	3	2, 3, 4, 9	4	2, 3, 4, 5, 10.
5.	2, 3, 4, 11	6	2, 11	7	2, 3, 5, 10	8	2, 4.
9.	None.	10.	5	11	2, 3, 4, 8, 11.	12.	2, 3, 4, 8, 9, 11.
13.	3, 5.	14	5	15	2, 4, 5, 8, 10.	16.	2, 4, 5, 8, 10.
17.	3, 9	18	3, 11.	19.	2, 3	20	2, 3, 5, 9, 10.
21.	7.	22	11	23	13	24	7, 11, 13.
25.	11.	26.	7, 13	27.	None.	28.	7, 11, 13.
29.	6, 12	30	6, 12.	31	6, 12, 30.	32.	None
33.	2, 1		34	1, 7, 2		35	2717

### Examples 54

1.	$2^3$ .	2	$2^3 3$ .	3.	$2 3^2$	4.	$2^3 3$ .	5.	$3^5$ .
6.	$2^6$ .	7.	$2^4 3$ .	8	$2 5^2$	9.	$3^3 7$ .	10.	$2^6$ .
11.	$2^4 5$	12	$2^3 11$ .	13	$3^2 11$	14.	$2^2 5^2$ .	15.	$2^2 3^3$
16.	$2^4 11$ .	17	$3^3 13$ .	18	$2^6 3^2$ .	19	$3^2 5 11$ .	20.	$5^4$ .
21	$3^8 37$	22	$2 3 5^2 7$	23	$2^4 3^4$	24.	$2^6 5 11$ .	25.	$2^4 5^3$
26	$2 5^2 73$	27	$2^7 3^2 5$ .	28	$3^3 7 13$	29	$2^9 3^8$ .		
30.	$2^3 3 5^2 23 29$	31.	prime.	32.	prime	33.	$3^4$ .		
34.	prime	35.	prime	36	prime.	37	prime.	38	$3^2 23$ .
39.	prime	40.	prime	41	$11^2 31$	42.	$3 13^2$	43	$17 269$
44.	prime	45	$23 31$	46.	prime.	47	$13 503$	48.	$11 163$
49.	prime	50.	$29 47$ .	51.	10	52.	11.	53	11
54	$5, 7,$	55	$5, 7,$	56.	$6, 8, 12, 24$ .				

### Examples. 55.

1.	3	2	4.	3.	5	4.	18.	5	5.	6.	12.
7.	75.			8.	4.	9	24	10.	5.	11.	4.
12.	No common factor.		13.	56.	14.	25.	15.	28.			

## Examples. 56.

1. 48.	2. 2.	3. 4	4. 12.	5. 29.	6. 124
7. 101.	8. 143.	9. 377	10. 7.	11. 133.	12. 25
13. 19.	14. 15	15. 53	16. 28.	17. 39.	18. 113.
19. 173.	20. 147.	21. 221.	22. 3	23. 57.	24. 287.
25. 213.	26. 221	27. 15	28. 1536.	29. 257.	30. 6.
31. No.	32. Yes.	33. No.	34. Yes.	35. No.	36. No.
37. Yes.	38. Yes.	39. No.	40. 37.	41. 37.	42. 23.
43. 17.	44. 3.	45. 5	46. 3.	47. 63.	48. 17.
49. 57.	50. 2.	51. 2.	52. R1. 4a		53. 3d.
54. 16.	55. 32.	56. No.	57. 180 gall.		58. 1 tola.

## Examples. 57.

1. 96.	2. 3724.	3. 891.	4. 3520.	5. 7488.
6. 259488.		7. 672.	8. 23374	9. 87087.
10. 759655.		11. 49077.	12. 734877.	13. 96672.
14. 159137.		15. 183645	16. 2672700.	17. 2310.
18. 2376.		19. R5256 12a.	20. 64.	21. 390.

## Examples. 58.

1. 48	2. 48.	3. 720.	4. 36.	5. 2520.
6. 1680.	7. 28050.	8. 360.	9. 1890.	10. 7560.
11. 7200.	12. 144.	13. 8415.	14. 7920.	15. 792.
16. 3570.	17. 228150.	18. 98280.	19. 49140.	20. 5481.
21. 237510.	22. 2520.	23. 1680.		24. 10800.
25. 98280.	26. 189.	27. 389.		28. 141.
29. 1296 sq. in.	30. £189	31. 14 min.		32. 90 miles.
33. 131 yd 9 in.	34. 677.	35. 232792560.	36. 75 yards.	

## Examples. 59.

1. 4a.	2. 4s.	3. 2g.	4. 1 seer.	5. 5a. 6. 9s.
7. 7 m.	8. 5d.	9. 10 m.	10. 4d.	11. 3 pice.
12. 3 cwt.	13. 160 yd.	14. 6 ch.	15. 9 sq. m.	16. 7 lb.
17. 6a.	18. 9a.	19. 1 ft.	20. 4d.	21. 15 min.

## Examples. 60.

1.  $\frac{18}{5}; \frac{45}{8}; \frac{63}{8}; \frac{90}{9}$ . 2.  $\frac{22}{2}; \frac{99}{9}; \frac{121}{11}; \frac{275}{25}; \frac{385}{35}$ .  
 3.  $\frac{105}{5}; \frac{284}{8}; \frac{11225}{5}$ . 4.  $\frac{19}{2}, \frac{15}{15}, \frac{89}{89}, \frac{500}{500}, \frac{42}{12}, \frac{63}{18}, \frac{386}{386}, \frac{2100}{600}$ .  
 5.  $\frac{90}{90}; \frac{54}{54}; \frac{70}{70}, \frac{12}{12}; \frac{36}{36}$ . 6.  $\frac{3}{11}, \frac{4}{5}, \frac{6}{10}$ . 7.  $\frac{6}{5}, \frac{5}{5}, \frac{5}{5}; \frac{7}{5}$ .

## Examples. 61.

1.  $\frac{1}{2}$ . 2.  $\frac{1}{3}$ . 3.  $\frac{1}{2}$ . 4.  $\frac{1}{4}$ . 5.  $\frac{3}{2}$ .  
 6.  $\frac{5}{3}$ . 7.  $\frac{4}{3}$ . 8.  $\frac{3}{2}$ . 9.  $\frac{2}{3}$ . 10.  $\frac{1}{3}$ .  
 11.  $\frac{4}{3}$ . 12.  $\frac{7}{8}$ . 13.  $\frac{4}{5}$ . 14.  $\frac{3}{4}$ . 15.  $\frac{3}{4}$ .  
 16.  $\frac{1}{3}$ . 17.  $\frac{1}{5}$ . 18.  $\frac{1}{2}$ . 19.  $\frac{14}{25}$ . 20.  $\frac{2}{5}$ .

## Examples. 61a

1.  $\frac{2}{3}$ . 2.  $\frac{4}{5}$ . 3.  $\frac{3}{10}$ . 4.  $\frac{2}{15}$ . 5.  $\frac{3}{5}$ . 6.  $\frac{1}{2}$ .  
 7.  $\frac{19}{21}$ . 8.  $\frac{7}{10}$ . 9.  $\frac{7}{9}$ . 10.  $\frac{5}{6}$ . 11.  $\frac{7}{6}$ . 12.  $\frac{5}{6}$ .  
 13.  $\frac{2}{21}$ . 14.  $\frac{5}{11}$ . 15.  $\frac{22}{21}$ . 16.  $\frac{11}{17}$ . 17.  $\frac{8}{15}$ . 18.  $\frac{11}{16}$ .  
 19.  $\frac{11}{18}$ . 20.  $\frac{9}{9}$ . 21.  $\frac{13}{17}$ . 22.  $\frac{2}{3}$ . 23.  $\frac{11}{13}$ . 24.  $\frac{17}{21}$ .  
 25.  $\frac{13}{18}$ . 26.  $\frac{22}{27}$ . 27.  $\frac{4}{1}$ . 28.  $\frac{108}{64}$ . 29.  $\frac{22}{15}$ . 30.  $\frac{60}{11}$ .  
 31.  $\frac{42}{47}$ . 32.  $\frac{4}{7}$ . 33.  $\frac{98}{99}$ . 34.  $\frac{5}{4}$ . 35.  $\frac{11}{16}$ .

## Examples. 61b.

1.  $\frac{1}{6}$ . 2.  $\frac{5}{6}$ . 3.  $\frac{5}{6}$ . 4.  $\frac{3}{2}$ . 5.  $\frac{6}{15}$ . 6.  $\frac{1}{14}$ .  
 7.  $\frac{1}{12}$ . 8.  $\frac{63}{175}$ . 9.  $\frac{7}{8}$ . 10.  $\frac{34}{5}$ . 11.  $\frac{8}{15}$ . 12.  $\frac{6}{7}$ .

## Examples. 62

1.  $\frac{19}{3}$ . 2.  $\frac{27}{5}$ . 3.  $\frac{103}{11}$ . 4.  $\frac{31}{10}$ . 5.  $\frac{29}{5}$ .  
 6.  $\frac{101}{100}$ . 7.  $\frac{843}{70}$ . 8.  $\frac{403}{20}$ . 9.  $\frac{1401}{41}$ . 10.  $\frac{8101}{50}$ .  
 11.  $\frac{5801}{200}$ . 12.  $\frac{1302}{50}$ . 13.  $\frac{648}{25}$ . 14.  $\frac{12421}{111}$ . 15.  $\frac{9811}{60}$ .  
 16.  $\frac{743}{100}$ . 17.  $\frac{8329}{1000}$ . 18.  $\frac{2255}{101}$ . 19.  $\frac{8044}{201}$ . 20.  $\frac{400}{99}$ .

## Examples. 63

1.  $3\frac{1}{2}$ . 2.  $2\frac{1}{8}$ . 3.  $4\frac{1}{3}$ . 4.  $5\frac{1}{2}$ . 5.  $3\frac{2}{3}$ .  
 6.  $3\frac{1}{4}$ . 7. 9. 8.  $6\frac{1}{3}$ . 9.  $9\frac{3}{10}$ . 10. 5.  
 11.  $2\frac{11}{14}$ . 12. 4. 13.  $3\frac{1}{4}$ . 14.  $4\frac{1}{2}$ . 15.  $3\frac{1}{8}$ .  
 16.  $4\frac{2}{3}$ . 17.  $2\frac{39}{101}$ . 18.  $7\frac{1}{11}$ . 19.  $5\frac{63}{11}$ . 20. 7.  
 21.  $28\frac{2}{3}$ . 22. 329. 23.  $101\frac{1}{4}$ . 24. 10. 25.  $48\frac{4}{7}$ .  
 26.  $2\frac{1}{8}$ . 27.  $11\frac{301}{425}$ . 28.  $10\frac{1}{173}$ . 29. 11. 30.  $4\frac{29}{37}$ .

## Examples 64.

1.  $\frac{3}{12}, \frac{10}{12}$     2.  $\frac{9}{30}, \frac{8}{30}$ .    3.  $\frac{85}{80}, \frac{12}{80}$     4.  $\frac{6}{12}, \frac{4}{12}, \frac{3}{12}$ .  
 5.  $\frac{40}{60}, \frac{45}{60}, \frac{48}{60}$     6.  $\frac{140}{160}, \frac{144}{160}, \frac{147}{160}$     7.  $\frac{27}{72}, \frac{56}{72}, \frac{30}{72}$     8.  $\frac{44}{90}, \frac{35}{90}, \frac{63}{90}$ .  
 9.  $\frac{15}{240}, \frac{70}{240}, \frac{66}{240}$ .    10.  $\frac{40}{300}, \frac{45}{300}, \frac{3}{300}$ .    11.  $\frac{126}{300}, \frac{35}{300}, \frac{970}{300}$ .  
 12.  $\frac{36}{900}, \frac{40}{900}, \frac{45}{900}$ .    13.  $\frac{40}{12}, \frac{51}{12}, \frac{74}{12}$ .    14.  $\frac{48}{24}, \frac{4}{24}, \frac{3}{24}$ .  
 15.  $\frac{36}{12}, \frac{60}{12}, \frac{7}{12}$ .    16.  $\frac{16}{105}, \frac{350}{105}, \frac{210}{105}, \frac{63}{105}$ .    17.  $\frac{36}{12}, \frac{4}{12}, \frac{48}{12}, \frac{3}{12}$ .  
 18.  $\frac{30}{60}, \frac{20}{60}, \frac{15}{60}, \frac{12}{60}, \frac{10}{60}$ .    19.  $\frac{14}{154}, \frac{21}{154}, \frac{8}{154}, \frac{33}{154}, \frac{154}{154}$ .  
 20.  $\frac{1155}{3465}, \frac{3070}{3465}, \frac{2475}{3465}, \frac{2695}{3465}, \frac{2835}{3465}$ .    21.  $\frac{730}{600}, \frac{440}{600}, \frac{325}{600}, \frac{465}{600}, \frac{703}{600}$ .  
 22.  $\frac{288}{144}, \frac{336}{144}, \frac{84}{144}, \frac{64}{144}, \frac{99}{144}$ .    23.  $\frac{240}{2400}, \frac{160}{2400}, \frac{40}{2400}, \frac{15}{2400}, \frac{24}{2400}$ .  
 24.  $\frac{26}{48}, \frac{160}{48}, \frac{348}{48}, \frac{45}{48}, \frac{16}{48}$ .    25.  $\frac{2720}{6120}, \frac{240}{6120}, \frac{78}{6120}, \frac{114}{6120}, \frac{153}{6120}$ .  
 26.  $\frac{12}{24}, \frac{180}{24}, \frac{56}{24}, \frac{20}{24}, \frac{21}{24}$ .    27.  $\frac{128}{112}, \frac{80}{112}, \frac{66}{112}, \frac{112}{112}, \frac{35}{112}, \frac{232}{112}$ .

## Examples 65.

1.  $\frac{8}{12}$ .    2.  $\frac{9}{12}$ .    3.  $\frac{13}{20}$ .    4.  $\frac{16}{10}$ .    5.  $\frac{7}{5}$ .    6.  $\frac{29}{47}$ .  
 7.  $\frac{24}{25}$  greatest,  $\frac{15}{16}$  least.    8.  $\frac{10}{11}$  greatest,  $\frac{7}{8}$  least.  
 9.  $\frac{20}{21}$  greatest,  $\frac{19}{20}$  least.    10.  $\frac{15}{18}$  greatest,  $\frac{2}{3}$  least.  
 11.  $\frac{9}{10}$  greatest,  $\frac{15}{18}$  least.    12.  $\frac{9}{25}$  greatest,  $\frac{7}{24}$  least.  
 13.  $\frac{3}{4}, \frac{7}{12}, \frac{5}{6}$ .    14.  $\frac{18}{15}, \frac{7}{15}, \frac{4}{15}$ .    15.  $\frac{11}{13}, \frac{7}{13}, \frac{2}{13}$ .  
 16.  $\frac{15}{4}, \frac{3}{2}, \frac{27}{8}$ .    17.  $\frac{36}{36}, \frac{31}{36}, \frac{21}{36}$ .    18.  $\frac{348}{348}, \frac{248}{348}, \frac{87}{348}$ .  
 19.  $\frac{6}{7}, \frac{8}{7}, \frac{18}{7}, \frac{4}{7}$ .    20.  $\frac{112}{112}, \frac{56}{112}, \frac{3}{112}, \frac{7}{112}$ .    21.  $\frac{17}{12}, \frac{4}{12}, \frac{11}{12}, \frac{9}{12}$ .

## Examples. 66.

1.  $2\frac{1}{4}$ .    2.  $1\frac{2}{7}$ .    3.  $\frac{5}{9}$ .    4.  $1\frac{6}{11}$ .    5.  $2\frac{7}{10}$ .    6.  $1\frac{49}{50}$ .  
 7.  $1$ .    8.  $7\frac{3}{10}$ .    9.  $1\frac{2}{7}$ .    10.  $\frac{6}{5}$ .    11.  $1\frac{1}{12}$ .    12.  $1\frac{7}{35}$ .  
 13.  $1\frac{17}{240}$ .    14.  $1\frac{4}{5}$ .    15.  $1\frac{203}{240}$ .    16.  $1\frac{11}{12}$ .    17.  $1\frac{7}{48}$ .  
 18.  $1\frac{31}{540}$ .    19.  $1\frac{7}{180}$ .    20.  $4\frac{37}{105}$ .    21.  $2\frac{11}{80}$ .    22.  $1\frac{193}{170}$ .  
 23.  $2\frac{41}{200}$ .    24.  $4\frac{8}{15}$ .    25.  $2\frac{115}{308}$ .    26.  $1\frac{101}{488}$ .  
 27.  $3\frac{43}{96}$ .    28.  $2$ .    29.  $3\frac{1121}{1121}$ .    30.  $2\frac{541}{1020}$ .

## Examples. 67.

1.  $7\frac{4}{5}$ .    2.  $14\frac{1}{5}$ .    3.  $12\frac{7}{20}$ .    4.  $15\frac{23}{20}$ .    5.  $23\frac{3}{5}$ .  
 6.  $29\frac{18}{25}$ .    7.  $5\frac{8}{5}$ .    8.  $41\frac{2}{15}$ .    9.  $10\frac{10}{11}$ .    10.  $11\frac{7}{61}$ .  
 11.  $14\frac{25}{24}$ .    12.  $11\frac{1}{5}$ .    13.  $160\frac{5}{7}$ .    14.  $34\frac{52}{7}$ .    15.  $13\frac{8}{5}$ .  
 16.  $31\frac{4}{15}$ .    17.  $976\frac{4}{21}$ .    18.  $154\frac{1}{5}$ .    19.  $17\frac{106}{147}$ .    20.  $6\frac{3}{10}$ .  
 21.  $R29. 9a. 5\frac{3}{8}d$ .    22.  $L7. 17s. 0\frac{9}{16}d$ .

23. 15 yd. 2 ft  $6\frac{1}{8}$  in.24. 12 lb 1 oz.  $2\frac{8}{15}$  dr.25. 21 oz. 0 dwt  $19\frac{4}{5}$  gr26. 20 hr 24 min.  $33\frac{2}{5}$  sec.

## Examples. 68.

1.	$\frac{1}{2}$ .	2	$6\frac{1}{2}$	3	$\frac{1}{6}$ .	4	$1\frac{1}{2}$ .	5	$1\frac{1}{16}$	6.	$7\frac{1}{2}$ .
7.	$4\frac{1}{2}$	8	$1\frac{4}{5}$ .	9.	$1\frac{3}{10}$ .	10	$1\frac{3}{4}$	11	$1\frac{51}{100}$ .	12	$1\frac{101}{125}$ .
13.	$1\frac{11}{12}$	14	$5\frac{5}{14}$	15.	$1\frac{5}{16}$	16.	$1\frac{5}{18}$	17	$1\frac{1}{2}$	18.	$\frac{5}{6}$ .
19	$1\frac{1}{16}$	20	$10\frac{3}{16}$	21	$1\frac{7}{12}$	22	$1\frac{1}{13}$	23	$1\frac{7}{17}$	24	$1\frac{1}{16}$ .

## Examples. 69.

1.	$3\frac{1}{2}$	2	$2\frac{7}{20}$	3	$3\frac{1}{4}$ .	4.	$5\frac{8}{9}$	5.	$5\frac{4}{5}$ .
6.	$5\frac{9}{14}$ .	7	$6\frac{3}{14}$	8	$8\frac{5}{13}$	9	$2\frac{5}{6}$	10	$3\frac{2}{3}$ .
11.	$4\frac{8}{9}$ .	12	$5\frac{1}{12}$ .	13	$2\frac{1}{2}$	14	$8\frac{10}{27}$	15	$9\frac{55}{64}$ .
16.	$9\frac{4}{5}$	17.	$10\frac{3}{8}$	18	$6\frac{10}{120}$	19	$6\frac{7}{24}$	20	$9\frac{19}{24}$ .
21.	$2\frac{1}{2}$	22	$6\frac{8}{9}$	23	$8\frac{11}{12}$ .	24	$9\frac{17}{17}$	25	$8\frac{1}{2}$ .
26.	$12\frac{8}{11}$	27	$13\frac{17}{18}$	28	$10\frac{3}{11}$	29	$1\frac{7}{13}$	30	$6\frac{7}{18}$ .
31.	$6\frac{7}{8}$ .	32	$7\frac{1}{8}$	33	$3\frac{15}{16}$ .	34.	$2\frac{8}{15}$	35	$9\frac{1}{2}$
36.	$1\frac{5}{6}$ .	37.	$12\frac{2}{5}$	38	$14\frac{3}{5}$	39	$\frac{2}{7}$ .	40	$\frac{1}{3}$ .
41.	R10 12. $1\frac{1}{2}$			42	R2 12. 9 $\frac{1}{2}$ .			43.	R4 4. 3 $\frac{3}{8}$ .
44.	£10 9. $5\frac{7}{16}$			45	£5 12. $10\frac{1}{16}$			46	6 yd. $5\frac{8}{9}$ in.

## Examples. 70.

1.	$4\frac{3}{4}$ .	2	7	3	$10\frac{1}{2}$	4	$3\frac{6}{7}$	5	$5\frac{1}{3}$ .
6.	$19\frac{1}{2}$	7	$10\frac{1}{2}$	8	300	9	$2\frac{1}{5}$	10	$10\frac{1}{2}$
11.	$22\frac{1}{2}$	12	$23\frac{1}{2}$	13	$18\frac{3}{8}$	14	$60\frac{3}{7}$	15.	195
16.	$6\frac{6}{13}$	17	$13\frac{1}{2}$	18	$47\frac{3}{8}$	19	$66\frac{6}{7}$	20	$100\frac{6}{13}$ .
21.	$33\frac{9}{16}$ .	22	$62\frac{1}{2}$	23	$326\frac{8}{9}$	24.	$198\frac{9}{16}$	25	213
26.	$1224\frac{1}{4}$	27	$487\frac{1}{2}$	28	$177\frac{1}{2}$	29.	$28\frac{11}{100}$ .	30	$38\frac{11}{40}$ .
31.	$18\frac{981}{1000}$			32	$44\frac{11}{16}$			33	$899\frac{911}{1000}$ .
34.	$386\frac{1}{16}$			35	$22999\frac{977}{1000}$ .			36	$3190\frac{1}{8}$
37.	$209\frac{37}{100}$			38	$6399\frac{7}{16}$ .			39	$51.18.1\frac{11}{12}$ .
40.	£4 9. $7\frac{1}{2}$ .			41.	R50 7 $\frac{1}{2}$ .			42.	R49.4. $5\frac{1}{2}$ .
43.	£2.4.5			44	£36.7. $2\frac{1}{2}$ .				

## Examples. 71.

1.	$\frac{1}{6}$	2.	$\frac{15}{16}$ .	3.	$\frac{5}{25}$	4.	$\frac{1}{3}$ .	5.	$\frac{5}{64}$ .
6.	$\frac{1}{115}$	7.	$\frac{5}{144}$ .	8.	$\frac{9}{100}$ .	9.	$\frac{7}{37}$ .	10.	$\frac{3}{125}$ .

11.  $1\frac{11}{20}$ . 12.  $7\frac{7}{18}$ . 13.  $3\frac{2}{3} \cdot$  14.  $5\frac{6}{7} \cdot$  15.  $10\frac{5}{7} \cdot$   
 16.  $10\frac{5}{28} \cdot$  17.  $1\frac{5}{8} \cdot$  18.  $1\frac{5}{12} \cdot$  19.  $2\frac{1}{25} \cdot$  20.  $8\frac{8}{9} \cdot$   
 21.  $1\frac{1}{4} \cdot$  22.  $2\frac{2}{7} \cdot$  23.  $1\frac{8}{18} \cdot$  24.  $3\frac{2}{5} \cdot$  25.  $42\frac{3}{4} \cdot$   
 26.  $12\frac{11}{16} \cdot$  27.  $178\frac{1}{3} \cdot$  28.  $6\frac{4}{7} \cdot$  29.  $15\frac{11}{20} \cdot$  30.  $10\frac{83}{160} \cdot$   
 31.  $62\frac{7}{15} \cdot$  32.  $38\frac{11}{27} \cdot$  33.  $21\frac{13}{17} \cdot$  34.  $1\frac{2}{3} \cdot$   
 35. £1. 5. 6 $\frac{5}{16}$ . 36. R2 8. 7 $\frac{1}{12}$ . 37. £1. 17. 0 $\frac{6}{85}$ .  
 38. £7. 13. 10 $\frac{23}{15}$ . 39. 80 40. 192 $\frac{2}{7}$ . 41. 43 $\frac{11}{15}$ .  
 42. 112 $\frac{2}{11}$ . 43. 4 $\frac{11}{12}$ . 44. 26 $\frac{1}{7}$ . 45. 217 $\frac{8}{7}$ . 46. 146 $\frac{3}{16}$ .  
 47. R2. 9. 0 $\frac{1}{8}$ . 48. R1. 4. 0 $\frac{6}{11}$ . 49. R32. 5. 6 $\frac{1}{18}$ .  
 50. R6. 4. 2 $\frac{15}{16}$  51. £3. 11. 6 $\frac{1}{7}$ . 52. £3. 19. 11 $\frac{1}{13}$ .

## Examples. 72.

1.  $\frac{5}{6}$ . 2.  $2\frac{1}{2}$ . 3.  $\frac{4}{3}$ . 4.  $1\frac{8}{15}$ . 5.  $4\frac{1}{2}$ . 6.  $2\frac{7}{200}$ .  
 7.  $\frac{2}{5}$ . 8.  $2\frac{5}{6}$ . 9.  $\frac{8}{5}$ . 10.  $3\frac{1}{8}$ . 11.  $1\frac{2}{3}$ . 12.  $2\frac{1}{7}$ .  
 13.  $32\frac{3}{5} \cdot$  14.  $25\frac{5}{8} \cdot$  15.  $3 \cdot$  16.  $14\frac{2}{3} \cdot$  17.  $10 \cdot$   
 18. 8. 19.  $28\frac{7}{15} \cdot$  20.  $16\frac{5}{18} \cdot$  21.  $9\frac{1}{2} \cdot$  22. 8.  
 23.  $3\frac{1}{4} \cdot$  24. 35. 25. 8. 26.  $15\frac{3}{4} \cdot$  27.  $12\frac{1}{4} \cdot$   
 28.  $40\frac{1}{2} \cdot$  29.  $286\frac{2}{7} \cdot$  30.  $\frac{4}{3} \cdot$  31.  $2\frac{1}{20} \cdot$  32.  $31\frac{1}{4} \cdot$   
 33.  $\frac{15}{56} \cdot$  34.  $\frac{5}{14} \cdot$  35.  $1\frac{1}{17} \cdot$  36. 28. 37. 294.

## Examples. 73.

1. 1386 in. 2. 2574 in. 3. 5742 in. 4. 7722 in.  
 5. 9702 in. 6. 39582 in. 7. 673308 in. 8. 274428 sq. in.  
 9. 509652 sq. in. 10. 1136916 sq. in. 11. 1528956 sq. in.  
 12. 1920996 sq. in. 13. 59864508 sq. in. 14. 4033699560 sq. in.

## Examples. 74.

1.  $1\frac{5}{6} \cdot$  2.  $2\frac{2}{7} \cdot$  3. 1. 4.  $1\frac{1}{27} \cdot$  5.  $1\frac{5}{6} \cdot$   
 6. 14. 7. 3. 8.  $2\frac{1}{4} \cdot$  9.  $18\frac{3}{5} \cdot$  10.  $1\frac{1}{3} \cdot$   
 11.  $\frac{4}{5} \cdot$  12.  $1\frac{10}{11} \cdot$  13.  $11\frac{5}{6} \cdot$  14.  $6\frac{2}{7} \cdot$  15.  $17\frac{17}{50} \cdot$   
 16.  $9\frac{9}{25} \cdot$  17.  $2\frac{11}{16} \cdot$  18.  $1\frac{1}{2} \cdot$  19.  $1\frac{1}{3} \cdot$  20.  $2\frac{2}{3} \cdot$   
 21.  $\frac{3}{2} \cdot$  22.  $1\frac{1}{3} \cdot$  23.  $6\frac{2}{5} \cdot$  24.  $3\frac{5}{17} \cdot$  25. 16.  
 26.  $4\frac{6}{5} \cdot$  27.  $1\frac{1}{27} \cdot$  28.  $\frac{6}{13} \cdot$  29.  $93\frac{1}{8} \cdot$  30. The former.

## Examples. 75.

1.  $1\frac{1}{3} ; 1.$  2.  $1\frac{3}{5} ; 2\frac{1}{4}.$  3.  $1\frac{8}{17} ; 2\frac{2}{7}.$  4.  $2\frac{2}{5} ; 3.$   
 5.  $3\frac{1}{5} ; 20.$  6.  $1\frac{1}{2} ; 10\frac{1}{2}.$  7.  $3\frac{1}{3} ; 409\frac{1}{3}.$  8.  $1\frac{1}{10} ; 42.$

9.  $\frac{1}{2}$ , 157 $\frac{1}{2}$ . 10.  $1\frac{1}{2}$ , 63 11.  $1\frac{1}{2}$ , 8 12.  $3\frac{3}{5}$ ; 70 $\frac{1}{3}$ .  
 13. 3 m. 14.  $2\frac{2}{3}$ . 15. 1 min. 45 sec

## Miscellaneous Examples. 76

1.  $6\frac{1}{5}$ . 2.  $1\frac{1}{5}$ . 3.  $5\frac{1}{6}$ . 4.  $1\frac{1}{7}$ . 5.  $1\frac{1}{8}$ . 6. 5  
 7.  $16\frac{1}{4}$ . 8.  $2\frac{1}{3}$ . 9.  $\frac{1}{4}4$ . 10.  $5\frac{1}{2}$ . 11.  $RS40$ . 12.  $6.10\frac{1}{2}$   
 13. 950 lb. 14.  $R1520$ . 15.  $\frac{1}{4}50$ . 16.  $4\frac{1}{2} \times 3\frac{1}{3}$ . 17.  $\frac{1}{8}$   
 18.  $\frac{1}{2}$ . 19.  $\frac{1}{8}5$ . 20.  $\frac{2}{3}$ . 21.  $\frac{1}{4}$ . 22.  $\frac{13}{100}$   
 23.  $\frac{1}{2}6$ . 24.  $\frac{1}{8}6$ . 25.  $\frac{3}{5}7$ . 26.  $\frac{2}{3}$ . 27.  $R60$   
 28.  $\frac{1}{4}720$ . 29.  $15\frac{1}{3}$ . 30. 22 miles. 31. 400 inches  
 32. 8, 6, 3, 2, 24 kings in all. 33. 34. 34.  $1\frac{1}{5}1$ . 35.  $1\frac{1}{7}$ .  
 36. 5 times. 37.  $1\frac{1}{3}$ . 38. 27 hours. 39.  $3\frac{1}{3}$ . 40. 310  
 41. 13, 17. 42. 36.

## Examples. 77

1.  $\frac{3}{4}$ . 2.  $1\frac{1}{7}$ . 3.  $3\frac{8}{5}$ . 4.  $12$ . 5.  $1\frac{1}{3}$ . 6.  $2\frac{2}{3}5$ .  
 7.  $\frac{3}{2}8\frac{3}{4}$ . 8.  $4\frac{1}{10}$ . 9.  $1\frac{1}{8}$ . 10.  $\frac{2}{3}$ . 11. 3. 12. 3  
 13.  $5\frac{1}{6}$ . 14.  $96\frac{4}{7}$ . 15. 17. 16.  $3\frac{4}{9}8$ . 17.  $4\frac{1}{2}$ . 18.  $\frac{1}{4}$ .  
 18.  $11\frac{6}{14}$ . 20.  $1\frac{1}{1}$ . 21. 18. 22.  $8\frac{4}{8}1$ . 23.  $\frac{2}{3}$ . 24.  $1\frac{17}{88}$ .

## Examples. 78

1.  $\frac{3}{4}$ . 2.  $1\frac{1}{3}$ . 3.  $1\frac{1}{7}$ . 4.  $2\frac{10}{17}$ . 5.  $25\frac{1}{8}$ . 6.  $15\frac{1}{3}$ .  
 7.  $1\frac{6}{5}7$ . 8.  $6\frac{2}{15}8$ . 9.  $4\frac{4}{7}3$ . 10.  $\frac{1}{7}$ . 11.  $\frac{2}{7}6$ . 12.  $1\frac{1}{7}$

## Examples. 79.

1.  $\frac{35}{12}$ . 2.  $\frac{4}{5}$ . 3.  $1\frac{8}{15}$ . 4. 6. 5. 1. 6.  $1\frac{1}{3}3$ .  
 7.  $1\frac{1}{4}$ . 8.  $\frac{1}{2}$ . 9.  $1\frac{1}{2}$ . 10.  $1\frac{1}{4}$ . 11.  $\frac{1}{3}$ . 12.  $\frac{3}{17}$ .  
 13.  $3\frac{8}{16}$ . 14.  $\frac{1}{2}$ . 15. 2. 16.  $1\frac{1}{2}8$ . 17.  $22\frac{2}{9}$ . 18.  $\frac{1}{2}$ .  
 19. 2. 20.  $1\frac{8}{15}$ . 21.  $22\frac{2}{3}$ . 22.  $\frac{6}{5}1$ . 23.  $2\frac{1}{2}1$ . 24.  $\frac{6}{5}3$

## Examples. 80.

1. 3. 2.  $3\frac{1}{2}$ . 3.  $1\frac{9}{14}$ . 4.  $3\frac{5}{6}$ . 5.  $9\frac{17}{12}$ . 6.  $1\frac{5}{8}$ .  
 7.  $1\frac{1}{2}$ . 8.  $7\frac{5}{4}$ . 9.  $7\frac{7}{35}$ . 10.  $1\frac{1}{9}$ . 11.  $4\frac{1}{2}4\frac{9}{8}$ . 12.  $1\frac{1}{2}5\frac{1}{2}$ .  
 13.  $4\frac{11}{16}$ . 14. 1. 15.  $\frac{1}{3}6$ . 16.  $12\frac{1}{6}$ . 17.  $4\frac{2}{3}7\frac{7}{4}$ . 18.  $1\frac{11}{4}$ .

## Examples. 81.

1. 1.	2. $1\frac{1}{2}$ .	3. $7\frac{5}{12}$ .	4. $6\frac{1}{24}$ .	5. $\frac{25}{168}$ .
6. $5\frac{11}{168}$ .	7. $\frac{61}{3184}$ .	8. $3\frac{9}{224}$ .	9. $1\frac{121}{128}$ .	10. $9\frac{13}{16}$ .
11. $7\frac{2}{4}$ .	12. $4\frac{1}{4}$ .	13. $4\frac{3}{4}$ .	14. $5\frac{8}{4}$ .	15. $8\frac{11}{16}$ .
16. $12\frac{7}{16}$ .	17. 1.	18. 10.	19. $1\frac{4}{17}$ .	20. $\frac{11}{16}$ .
21. $\frac{1}{6}$ .	22. $2\frac{2}{5}$ .			

## Examples. 82.

1. $\frac{9}{58}$ .	2. 2.	3. 2	4. $1\frac{3741}{10734}$ .	5. $3\frac{1}{3}$
6. $2\frac{7}{455}$ .	7. 1.	8. $14\frac{1}{18}$ .	9. $\frac{3}{28}$ .	10. $1\frac{1}{9}$
11. $3\frac{25}{364}$ .	12. $\frac{39}{37}$ .	13. 3.	14. $5\frac{19}{280}$ .	15. $573\frac{3}{11}$ .
16. 49.	17. $\frac{75}{7}$ .	18. $\frac{1}{12}$ .	19. $5\frac{1}{3}$ .	20. $5\frac{69}{885}$ .
21. $1\frac{1}{4}$ .	22. $\frac{5}{7}$ .	23. 1	24. 4	25. $\frac{7}{8}$
26. 1.	27. $\frac{3}{35}$ .	28. $\frac{615}{2288}$	29. $84\frac{72}{77}$ .	30. $10\frac{49}{138}$ .
31. $\frac{85}{176}$ .	32. $22\frac{3}{4}$ .	33. $1\frac{2}{33}$ .	34. $3\frac{7}{10}$ .	35. $3\frac{9}{84}$

## Examples. 83.

1. R3. 10. 4	2. R1. 10 8	3. R1. 14a
4. R8 8. 8.	5. R1. 3 6	6. 7a 6d.
7. £33 16. 4.	8. £58 10s	9. £29 14s.
10. R70. 9. 4	11. R1 12 8	12. R1. 2. 8
13. £11. 5. 9 $\frac{1}{2}$ .	14. £38. 8s	15. 6s 3d
16. R52. 6 10 $\frac{1}{2}$	17. R19. 9. 9 $\frac{1}{2}$ .	18. 19s 6 $\frac{9}{15}$ d
19. £15 10. 2 $\frac{1}{2}$ .	20. R284. 2 6 $\frac{1}{2}$ .	21. £22. 14. 3 $\frac{184}{21}$ .
22. 4 cwt 2 qr. 24 lb. 12 oz.	23. 343 yd. 1 ft. 10 $\frac{1}{2}$ in	
24. 25 min. 25 $\frac{5}{12}$ sec	25. 2 pk. 1 $\frac{1}{2}$ gall	26. R146. 11. 11.
27. R1. 0 5 $\frac{1}{2}$ .	28. R122. 3. 8	29. £7. 19. 10 $\frac{1}{2}$
30. £22. 1. 9 $\frac{13}{28}$ .	31. R31. 8. 6 $\frac{3}{2}$ .	32. R5 10. 7
33. 10s 11 $\frac{35}{52}$ d.	34. 12a. 9 $\frac{139}{282}$ d.	35. £2. 8. 7 $\frac{1}{2}$ .
36. 16s 10 $\frac{1}{2}$ d.	37. R8. 5 1 $\frac{1}{2}$ .	38. R14. 6. 0 $\frac{104}{15}$ .
39. £3. 18 5 $\frac{3107}{28285}$ .	40. $\frac{11}{12}$ of R6. 11a. $\frac{1}{4}$ of R7. R $\frac{2}{3}$ .	
41. £14. 15. 2.	42. R8. 9. 4 $\frac{1}{2}$ .	43. R6. 5. 9 $\frac{2}{3}$ .
44. R217. 15. 6.	45. 18s. 9 $\frac{13}{28}$ d	

## Examples 84.

1.  $3\frac{1}{4}$  2.  $9\frac{1}{4}$  3.  $5\frac{5}{8}$  4.  $7\frac{1}{2}$  5.  $7\frac{1}{10}$  6.  $7\frac{1}{8}$   
 7.  $7\frac{1}{2}$  8.  $3\frac{1}{3}$  9.  $4\frac{15}{16}$  10.  $2\frac{9}{10}$  11.  $4\frac{4}{5}$  12.  $1\frac{13}{15}$   
 13.  $5\frac{3}{5}$  14.  $7\frac{11}{10}$  15.  $1\frac{103}{100}$  16.  $1\frac{9}{17}$  17.  $3\frac{1}{10}$  18.  $8\frac{1}{10}$   
 19.  $6\frac{3}{5}$  20.  $2\frac{24}{17}$  21.  $4\frac{16}{15}$  22.  $2\frac{1}{10}$  23.  $\frac{1}{3}$   
 24.  $8\frac{11}{12}$  25.  $42\frac{9}{11}$  26.  $52\frac{1}{11}$  27.  $1\frac{7}{11}$  28.  $1\frac{31}{10}$   
 29.  $2\frac{17}{20}$  30.  $8\frac{1}{4}$  31.  $5\frac{7}{15}$  32.  $1\frac{1}{10}$  33.  $\frac{1}{8}$   
 34.  $\frac{1}{5}$  35.  $2\frac{1}{14}$  36.  $1\frac{1}{8}$  37.  $1\frac{17}{23}$  38.  $2\frac{3}{7}$   
 39.  $6\frac{9}{100}$  40.  $2\frac{7}{8}$  41.  $3\frac{7}{11}$  42.  $36\frac{3}{10}$  43. 9.  
 44.  $2\frac{1}{24}$  45.  $2\frac{1}{33}$  46.  $1\frac{8}{15}$  47.  $1\frac{1}{13}$  48.  $2\frac{1}{4}$   
 49.  $1\frac{1}{16}$  50.  $1\frac{9}{15}$  51.  $1\frac{3}{150}$  52.  $1\frac{1}{3}$  53.  $\frac{5}{6}$

## Miscellaneous Examples. 85

1.  $1\frac{13}{15}$  2. R72. 3. R8 5a. 4d, R12. 8a, R12. 8a.  
 4. £7. 2. 1 $\frac{1}{2}$ . 5. R3 13a. 8d. 6. 19s 11 $\frac{3}{4}$ d.  
 7. £1. 13. 7 $\frac{1}{4}$  8.  $6\frac{6}{13}$  ft 9. R122. 13. 9  
 10. £2 9s. 11. R1. 6a. 12.  $2\frac{1}{2}$  13.  $\frac{1}{3}$  14.  $1\frac{8}{15}$   
 15. 1 $\frac{1}{2}$  12. 16.  $\frac{2}{5}$ . 17.  $\frac{3}{4}$ . 18. R785862.  
 19. R3. 4. 6. 20.  $\frac{4}{5}$ . 21. 72 oz 22. 12 lb Avoir. 23.  $\frac{1}{3}$ b.

## Examples 86

1. '3. 2. 201. 3. '07. 4. '104 5. '0008 6. 000009.  
 7. 12 04006 8. '013005. 9. 00010001. 10. 100 502.  
 11. 70, 7, 7000, 007 12. 290, 29, 29000, 029  
 13. 2, 02 ; 200, 002. 14. 2, 002, 20, 00002.  
 15. 34, '34, 3400, 0034 16. 70 3, 703, 7030, 00703  
 17. 10 03, 1003, 1003, 001003. 18. 07, 0007, 7, 000007  
 18. 392, 3 92, 39200, 0392. 20. 234 5, 2 345, 23450, 02345  
 21. 30000, 300, 3000000, 3 22. 1232, 12 32, 123200, 1232.  
 23. 1 24 01. 25. 35, 70 5; 40. 26. 25, '06, '3.

## Examples. 87.

1.  $\frac{2}{5}$  2.  $\frac{63}{100}$  3.  $\frac{1}{25}$  4.  $\frac{3}{2}$  5.  $\frac{27}{100}$   
 6.  $\frac{1}{50}$  7.  $\frac{1}{250}$  8.  $\frac{1}{20}$  9.  $\frac{1}{25}$  10.  $\frac{2}{25}$   
 11.  $\frac{1250}{3125}$  12.  $\frac{28}{100}$  13.  $\frac{1}{5}$  14.  $\frac{1}{16}$  15.  $\frac{11}{100}$

16.  $\frac{11}{160000}$ . 17.  $\frac{1620001}{20000}$ . 18.  $\frac{108}{16}$ . 19.  $\frac{16031}{3200}$ . 20.  $\frac{11600001}{480000}$ .  
 21.  $2\frac{1}{2}$ . 22.  $7\frac{1}{2}$ . 23.  $8\frac{1}{3}$ . 24.  $1\frac{3}{4}$ . 25.  $2\frac{1}{4}$ .  
 26.  $3\frac{1}{25}$ . 27.  $9\frac{1}{80}$ . 28.  $6\frac{3}{400}$ . 29.  $3\frac{1}{3000}$ . 30.  $7\frac{27}{400}$ .  
 31.  $12\frac{9}{40}$ . 32.  $11\frac{1}{10}$ . 33.  $2\frac{1}{10000}$ . 34.  $1\frac{711}{8200}$ . 35.  $1\frac{289}{400000}$ .  
 36.  $12\frac{165}{2048}$ . 37. 7. 38. 9. 39. 12. 40. 24.  
 41. '003. 42. '0725. 43. '0329. 44. '09. 45. 1 2345.  
 46. '002. 47. 200 03. 48. '01. 49. '0125. 50. '00079

## Examples 88.

1. 20'163. 2. 37'479. 3. 43 31 4. 80'33. 5. 10 36411.  
 6. 1. 7. 10. 8. 909'9099. 9. 14 53302 10. 8.  
 11. 1000. 12. 417'11157. 13. 669 2981. 14. 657 2236.  
 15. 732 131 16. £347'23478. 17. £747'0199.  
 18. 41'4819 min. 19. 332 475 ft 20. 41'307 in.

## Examples. 89.

1. 7 084. 2. 1 9711. 3. 1 09922. 4. 199'70334.  
 5. 62 65. 6. 204'103. 7. 000275 8. 0118766  
 9. 7 5554623. 10. 342 817. 11. 7. 12. 2'063  
 13. £7 0001. 14. £ 99949 15. 9 88309.  
 16. 696 162. 17. 83 9583 18. 1999 25218  
 19. 128 471. 20. By 3 14159. 21. By 2 7183.

## Examples. 90.

1. 74'52. 2. 36'2. 3. '13446. 4. 6006.  
 5. '001024. 6. '000324. 7. 28 00028. 8. 2456 8884.  
 9. 40 804 10. 30 228. 11. 1 62023. 12. 0003125.  
 13. 4264014. 14. 8. 15. '58 16 8. 17. 216'32.  
 18. 589'12. 19. 00008 20. '0000423. 21. 00003738028.  
 22. 819. 23. '0001. 24. '82008. 25. 3 5.  
 26. 3091'7497. 27. 1209 11. 28. '096. 29. 1344620025  
 30. 48'6328503. 31. 15 625 32. 015625. 33. '00008  
 34. 2 16. 35. 1'331. 36. 1 37. 000000125  
 38. 2401. 39. 00081. 40. 27 5. 41. 38'9375.  
 42. 2 607255. 43. 7 5667. 44. 900 0025. 45. 421 36875.

## Examples. 91.

1. 1'27.	2. 1'372.	3. 1'2	4. '00043
5. 1 99.	6. '0000479.	7. 000026375.	8. 10'3.
9. 000002.	10. 17 125	11. '0000000212	12. '0528.
13. 1 84782...	14. 00009 .	15. 2 49367...	16. '00040...
17. 00002 ..	18. 3 71428...	19. 1 30586...	20. 01900...
21. '00003...	22. 2 0625	23. 46625	24. 004857...
25. '236.	26. 12'181818...	27. 2 29375	28. '000540...
29. 659.	30. 001666..	31. 31 25	32. 352 25.
33. '24.	34. 2532	35. 1200	36. 640
37. 002	38. 374.	39. 20	40. 2040000
41. 22500.	42. 58070	43. 3596.	44. 12132.
45. 17500	46. 1 4	47. 750000	48. 007853.
49. 128 18518...	50. 5 20833 .	51. 33 33333...	52. 08366...
53. 02320. .	54. 00650 .	55. 33057851 23966...	
56. 83 33325.	57. 9'58904 .	58. 01216. .	59. 350
60. 752	61. 2'533333...	62. 6 3125.	63. 000092...
64. 32714 285714...	65. 5628 571428...		66. 1191 75
67. 1145 833333...	68. '018181..		69. 021428...
70. 377 777777...	71. 9	72. 8	73. 27
74. '5	75. 25	76. 75	77. 125
78. 1 4375	80. 3 09375	81. 9 875	82. 3 28.
83. 2'68	84. 33333...	85. 16666 .	86. 28571...
87. 27272...	88. 69230 ..	89. 1 44444...	90. 7 18181...
91. 8'33333...	92. 10 34482...		93. 58 41666...
94. '8, '75, '6666...		95. 5, 4166..., 2727...	
96. '55, 5333..., '525.		97. 375, 3125, '2187..	
98. '44, '4333 .., '35		99. 7777. , 7142 ., 6	
100. '0216.	101. 1125.	102. 3'135.	103. 2.

## Examples. 92.

1. '25 , 108 75.	2. '03 , 72'12	3. 004 , '4.	4. 24 , 6.
5. '005 , 1'6.	6. '12 ; 7 2.	7. 0001 ; '08.	8. '06 , 11754'6.
9. '03 , 1'8.	10. '06 ; 180.	11. '05 , 140.	12. '025 , 1'5.

## Examples. 93.

1. Non-terminating. 2. Terminating. 3. N.-T. 4. T.  
 5. N.-T. 6. N.-T. 7. N.-T. 8. N.-T. 9. N.-T.  
 10. N.-T. 11. T. 12. T. 13. T. 14. T.  
 15. N.-T. 16. 3, 6, 7, 9, 11, 12, 13, 14, 15, 17, 18, 19.

## Examples. 94.

1. .3. 2. .2. 3. .714285. 4. 1 16 5 1 18.  
 6. 1.538461. 7. .46. 8. 1 009 9. .27. 10 3 230769.  
 11. 11 904761. 12 .045. 13 3 780003.  
 14. .2083 15 3 8846153 16 7 481. 17 5 285714.  
 18. 10 076923 19. 7 13 20. 9 6428571 21 1 00198  
 22. 13 94230769 23. 4 803571428. 24. 3 4556097. 25 5 12.  
 26. .6. 27. 6 571428. 28. 1 772. 29. .126984.  
 30. 4 8. 31 .16. 32. .015. 33. .0015. 34. .00015.  
 35. 000015 36 8.106. 37. 3 13714285  
 38. .0588235294117647. 39. 2.105263157894736842.  
 40. 6869565217391304347826. 41 10 90. 42 .099900.  
 43. 2.307692 44. 2 857142. 45. 27.27. 46. 2.27.  
 47 7 8695652173913043478266. 48. 16.714285. 49 6 076923.  
 50. 642 857142. 51. 82 52 00072.

## Examples. 95.

1. .234534. 2. 34767. 3. .67676. 4. .23454.  
 5. .001231 6. .1234523. 7. .1234123. 8. .12345623.  
 9. .344444, .242424, .2678678.  
 10. .1020202020202, .1234234234234, .376537653765.  
 11. .233, .787. 12 345, .767, .722 13 .3077, .7676.  
 14. .076767, .777777, .000123. 15. .238888, .123412, .023232.  
 16. .3333, .7676, .7230. 17. .7777777, .12424242, .24723723.  
 18. .3444444, .2686868, .1231231. 19. .34022, .7823, .3111.  
 20. .4232323, .7272727, .1203203.

## Examples. 96.

1. .3. 2. .11. 3. .1. 4. .10. 5. .5. 6. .180. 7 .88.  
 8. .20. 9. .157. 10. .163. 11 .527. 12 .110

13.  $3\frac{13}{15}$ . 14.  $3\frac{21}{14}$ . 15.  $7\frac{14}{15}$ . 16.  $31\frac{7}{100}$ . 17.  $5\frac{2}{3}$ .  
 18.  $\frac{1}{18}$ . 19.  $2\frac{1}{11}$ . 20.  $10\frac{27}{100}$ . 21.  $3\frac{37}{100}$ . 22.  $\frac{1}{15}$ .  
 23.  $3\frac{17}{100}$ . 24.  $1\frac{19}{10}$ . 25.  $1\frac{1}{18}$ . 26.  $1\frac{4}{15}$ . 27.  $1\frac{12}{11}$ .  
 28.  $1\frac{67}{100}$ . 29.  $2\frac{1}{100}$ . 30.  $1\frac{99}{100}$ . 31.  $3\frac{7}{100}$ . 32.  $1\frac{29}{100}$ .  
 33.  $1\frac{1}{3}$ . 34.  $1\frac{1}{11}$ . 35.  $1\frac{1}{10}$ . 36.  $1\frac{1}{8}$ . 37.  $1\frac{19}{20}$ .  
 38.  $1\frac{11}{100}$ . 39.  $1\frac{89}{100}$ . 40.  $2\frac{100}{100}$ . 41.  $1\frac{17}{100}$ . 42.  $1\frac{69}{200}$ .  
 43.  $4\frac{4419}{2520}$ . 44.  $1\frac{8999}{9999}$ . 45.  $4\frac{41}{44}$ . 46.  $1\frac{725}{53}$ .  
 47.  $1\frac{8861}{3335}$ . 48.  $1\frac{88801}{9999}$ . 53. 1. 54. 368. 55. 17. 56. 1001. 57. 3. 58. 4. 59. 4. 60. 10.

## Examples. 97.

1. 378. 2. 7932. 3. 11095. 4. 648453. 5. 48287.  
 6. 10313082901. 7. 28579. 8. 898. 9. 10345.  
 10. 8002. 11. 10291837. 12. 5348655. 13. 1917230127.  
 14. 100936663. 15. 1117997. 16. 1723682719. 17. 9.  
 18. 587203. 19. 7501354643572465. 20. 4.  
 21. 115977942. 22. 26542987441. 23. 92468754556536734.  
 24. 37593. 25. 30777049. 26. 39489560667778.  
 27. 911001. 28. 338765. 29. 2472876. 30. 676523.  
 31. 8910. 32. 63458. 33. 246449334122601.  
 34. 4312. 35. 389386295. 36. 7161605349724.  
 37. 36442255331. 38. 1230786. 39. 7710735127582.  
 40. 2962301965.

## Examples. 98.

1. 002. 2. 1185. 3. 1338842... 4. 16.  
 5. 1086419753. 6. 51962. 7. 5. 8. 1055625.  
 9. 2335882352.. 10. 1518141.. 11. 2794932..  
 12. 7857142. 13. 236232... 14. 08281853. 15. 693957.

## Examples. 99.

1. 120428571. 2. 13316875. 3. 1075. 4. 5.  
 5.  $1\frac{17}{17}$  or 15048... 6. 350. 7. 12. 8. 03485. 9. 20.  
 10. 380952. 11. 125. 12. 113446. 13. 8.  
 14.  $1\frac{675}{10000}$  or 22269... 15. 998001. 16. 322.

## Examples. 100.

1. 1372<sup>8</sup>p. 2. 4<sup>5</sup>p. 3. 32<sup>1</sup>d. 4. 3<sup>6</sup>q. 5. 30p.  
 6. 302<sup>4</sup>q. 7. 1580<sup>8</sup>p. 8. 93<sup>3</sup>d 9. 1603<sup>84</sup>oz.  
 10. 78903 in. 11. £7. 5a. 2<sup>4</sup>p. 12. £3. 7s. 13. £2. 0a. 3<sup>84</sup>p.  
 14. £2. 6a. 7<sup>5</sup>p. 15. £2. 15s. 2<sup>4</sup>d. 16. 12a. 11<sup>52</sup>p.  
 17. £34. 4a. 3<sup>84</sup>p. 18. 1 ft 1<sup>824</sup> in. 19. 4 cwt 2 qr. 20<sup>16</sup> lb.  
 20. 12a. 8<sup>5</sup>p. 21. £6. 12a. 9p. 22. £12. 5a. 1<sup>2</sup>p.  
 23. £4. 9a. 1<sup>2</sup>p. 24. £45 1a. 6p. 25. £2. 12a. 10<sup>464</sup>p.  
 26. 16s. 6 9<sup>12</sup>d. 27. 1s. 9<sup>09375</sup>d. 28. 2<sup>7</sup>d.  
 29. £2. 8a. 6 7p. 30. £4 13s. 9d. 31. 1s. 7 12<sup>5</sup>d.  
 32. 10 md. 13 seers 4<sup>84</sup> ch. 33. 1 ton 8 cwt. 1 qr. 8 lb.  
 34. 2 po. 2 yd 1 ft 3<sup>9375</sup> in. 35. 22 hr. 19 min. 4<sup>275</sup> sec.  
 36. £7. 12a. 37. 2s. 3 04<sup>5</sup>d 38. £113. 7a. 39. £7. 13a.  
 40. £168. 7s. 5 09d. 41. £68. 3a. 1<sup>2</sup>p. 42. £15. 2a. 4p.  
 43. £3 14a 44. £17. 1a. 8p. 45. £4 15a 3 891p.  
 46. £1. 3s. 0<sup>1</sup>d. 47. 12s. 1<sup>2</sup>d. 48. £34 14s. 6 7916d.  
 49.  $\frac{1}{16}$  of £3 9a. '025 of £100. 10a. '32 of £5. 8a.  
 50. 3 $\frac{1}{2}$  of 1d. '256 of 1s. '0034 of £1. 51. £4. 12a. 2<sup>6</sup>p.  
 52. 2 59<sup>12</sup>d. 53. 9<sup>588</sup>d. 54. 16s. 55. £68. 2a 5 825536p.  
 56. 1 ton 17 cwt. 2 qr. 4 lb. 57. 6 md. 58.  $\frac{1}{6}$ d.

## Examples. 101.

1. £17.359375. 2. £8 797916. 3. 4.4642857 $\bar{1}$  tons.  
 4. 1 42045 mi. 5. 7715972 da. 6. £40.95. 7. 775.  
 8. 3640625. 9. 5.3385416. 10. 8<sup>5</sup>. 11. 1<sup>183</sup>.  
 12. 731875. 13. 1 375. 14. 395. 15. 572.  
 16. 7239583. 17. 1 0042011... 18. 7038. 19. 659375.  
 20. 751875. 21. 8296. 22. 620543... 23. 481283...  
 24. 578481... 25. 1.06875. 26. 1.045138. 27. 1.045918...  
 28. 4780219. 29. 15.054375. 30. '009142857. 31. '260416.  
 32. '36. 33. '2083. 34. '755952380. 35. '01. 36. '171296.  
 37. '35. 38. '0102339... 39. '0304615. 40. '328.

## Miscellaneous Examples. 102.

1. The value of 2 is  $\frac{2}{100}$ ; of 7,  $\frac{7}{10000}$ , of 3,  $\frac{3}{100000}$ .  
 2. '0076;  $\frac{1}{3142}$ . 3. '72;  $\frac{3}{888}$ . 4. '000282. 5. '362.

6. £225. 11s. 3d. 7. 1 ton 19 cwt. 3 qr. 3 lb. 8. '306.  
 9. £9000. 10. '6962. 11. 64'09, 49 3, 1'3. 12. 1520640.  
 13. 8000 times. 14. 29 times, 1'576 gallons over.  
 15. 21 times, rem. 2 ~~ds~~ 16. '5 17. 150804d. 18. 7 059 tons.  
 19. 8'571875 lb. 20. £33. 15. 1 $\frac{1}{2}$ d. 21. 4'255. 22. '00584...m.  
 23. 45 yd 2'1812 ft. 24. 1142; 054 in 25. '8095.  
 26. £1 649296. 27. 448 52990016 28. 8. 29. 8000.  
 30. '15. 31. £2 9a. 8d. 32. £81000. 33. 9 5087...  
 34. 45 lb greater. 35. 15*i* years. 36. 36 min. 24 sec.  
 37. 2s. 6d. 38. £20, £30. 39. A, £36, B, £12, C, £4. 40.  $\frac{1}{2}$ .

## Examples. 103.

1. 2'1053 2. '05882. 3. 1 0313. 4. 75'014.  
 5. 3949. 6. 1'11. 7. 2 00 8. 1'50.  
 9. 1'33. 10. 1'250. 11. 1 167. 12. '26667.  
 13. 1'41069. 14. '28768. 15. '20273. 15a. '909.  
 15b. '632. 15c. '182.  
 16. (i) 378400; (ii) 736000; (iii) '5207, (iv) 7'385,  
 (v) 2 010; (vi) 2 000, (vii) '03407; (viii) '009063  
 17. 3456800, 80057000. 18. (1) 4; (2) 3'9; (3) 3'93.  
 19. '143. 20. 3 14159.

## Examples. 103 (1).

1. 1'14286. 2. 1'02041. 3. '85714. 4. '95238.

## Examples. 103a.

1. 7'306. 2. 4'233 3. '0076. 4. 1180'5103.  
 5. 189 79409. 6. 64'20153 7. 7'704746. 8. '392754.  
 8a. 33799. 8b. 23 91753. 9. 66 939 10. '143292.  
 10a. 84998. 10b. 04154. 10c. 10'367. 10d. 1'113  
 10e. 2 5978 10f. 231 10g. 28,632,000,000. 11. 1 617.  
 12. 344 13. 1'229. 14. 12'310. 15. '1178.  
 16. 193'7204. 17. 530 13237. 18. 8231'60553. 19. 1072 476227.  
 20. 1084101'7079601. 20a. 0065. 20b. '00785.  
 21. 281. 22. 23'207065. 23. '91336. 24. '371.

## Examples. 103b.

1. 162.	2. 1892.	3. 20888.
4. 140.	5. 2011.	6. 1525.

## Examples. 104.

1. £1300.	2. £843 15s.	3. £49. 5a.	4. £9. 2s.
5. £6 13a. 9d.	6. £1675. 16s.	7. £327. 12a	
8. £542. 5s.	9. £2523. 9a.	10. £4. 11s. 8d.	
11. £400. 12a. 6d.	12. £42. 15s.	13. £226. 9a.	
14. £341. 9s. 6d.	15. £453. 14a. 6d.	16. £8. 11s. 5d	
17. £747. 5a. 3d.	18. £1730. 15s.	19. £2830. 12a. 6d.	
20. £8002. 7s. 4d.	21. £4894. 2a. 8d.	22. £251. 15s. 6 $\frac{1}{2}$ d.	
23. £7033 7a. 3d.	24. £45531. 11s. 3d.	25. £38397. 10a. 6d.	
26. £280508. 13s. 7 $\frac{1}{2}$ d.	27. £15060.	28. £11714. 18s. 11 $\frac{1}{2}$ d.	
29. £191898. 12a.	30. £2771. 19s. 3d.	31. £49514. 3a. 9 $\frac{1}{2}$ d.	
32. £39247. 4s. 2 $\frac{1}{2}$ d.	33. £644434. 11a. 4 $\frac{1}{2}$ d.	34. £78979. 3s. 4d.	
35. £3003	36. £243 15s. 5 $\frac{1}{2}$ d.	37. £20994. 8a. 10 $\frac{1}{2}$ d.	
38. £838. 3s. 3 $\frac{1}{2}$ d.		39. £34075. 14a. 0 $\frac{1}{2}$ d.	
40. £33673 9s. 10 $\frac{3}{4}$ d.		41. £7661. 9a. 0 $\frac{1}{2}$ d.	
42. £5027. 11s. 0 $\frac{3}{4}$ d.	43. £72. 6a. 8d.	44. £236 4s. 9 $\frac{1}{2}$ d.	
45. £1073. 15a. 0 $\frac{1}{2}$ d.		46. £31. 9s. 1 $\frac{3}{4}$ d.	

## Examples. 105.

1. £25. 10a. 6 $\frac{1}{2}$ d.	2. £44. 0a. 8d.	3. £93. 0s. 5 $\frac{5}{8}$ d.
4. £68. 14s. 9d.	5. £1347. 3s. 3 $\frac{1}{8}$ d.	6. £108. 15s. 3 $\frac{5}{8}$ d.
7. £57. 8s.	8. £38 2a. 10 $\frac{3}{8}$ d.	9. £100. 7a 10 $\frac{77}{128}$ d.
10. £67. 7a. 2d.	11. £27. 0a 2 $\frac{1}{2}$ d.	12. 8s. 1 $\frac{1}{2}$ d.
13. £2. 6s. 1 $\frac{1}{2}$ d.	14. £150 17s. 6 $\frac{7}{16}$ d. 15.	£59. 3s. 1 $\frac{1}{2}$ d.
16. £1835. 11a 9 $\frac{3}{8}$ d.	17. £180 2a. 3d.	18. £109 17s. 3d.
19. £4067. 2a. 4 $\frac{1}{8}$ d.		20. £4279. 6s 7 $\frac{1}{2}$ d.
21. 1 last 0 ld. 4 qr. 7 bus 0 $\frac{9}{16}$ pk.		22. 19 cwt 3 qr 9 $\frac{2}{5}$ lb.
23. £11. 15s. 7 $\frac{1}{2}$ d.		24. 30 tons 6 cwt. 1 qr. 14 lb.
25. 2529 md. 7 seers 8 ch.		26. £26. 15s 10 $\frac{1}{2}$ d.
27. £265. 9a. 5 $\frac{1}{2}$ d.	28. £14. 15s. 5 $\frac{1}{2}$ d	29. £45 4a 6d.
30. £239. 7s. 9 $\frac{3}{4}$ d.	31. £92. 1a. 5 $\frac{3}{8}$ d.	32. £959. 7a. 7d.
33. £9. 17s. 0 $\frac{1581}{600}$ d.	34. £4664. 3a. 10 $\frac{1}{2}$ d.	35. £7999. 15a. 9 $\frac{15}{16}$ d.

## Examples 106.

1. 21.	2. 24.	3. 27.	4. 31.	5. 32.	6. 81.
7. 75	8. 96.	9. 165.	10. 234.	11. 222.	12. 135.
13. 345.	14. 440.	15. 804	16. 847.	17. 2222.	18. 1679.
19. 1001.	20. 1234.	21. 9070.	22. 7906.		
23. 9876.	24. 4607.	25. 56804.	26. 80047.		
27. 15367.	28. 600098.	29. 543200.	30. 123456789.		
31. 41.	32. 80.	33. 76	34. 105.	35. 252.	36. 5.

## Examples. 107.

1. 30.	2. 40.	3. 18.	4. 24.	5. 36.
6. 64	7. 42	8. 84	9. 105.	10. 231.
11. 315.	12. 756.	13. 504.	14. 6006.	15. 66990.
16. 2.	17. 15.	18. 2.	19. 3600,	20. 900.

## Examples. 108.

1. 34.	2. 217.	3. 6'25	4. 9'08	5. '08.
6. '073.	7. 329.	8. 2'403	9. '0231.	10. '0045.
11. 15367.	12. 897.	13. '001849.	14. 1'001.	
15. 968 8669.	16. 27 6025...	17. 1'3038...	18. 15 4147...	
19. 2 2360...	20. 29'6063...	21. '3162...	22. 7071...	
23. 4 8062...	24. '9486...	25. 4 4721...	26. '1264...	
27. '0252...	28. 2 6457..	29. 8'1240...	30. 3 6055...	

## Examples. 109.

1. $\frac{14}{5}$ .	2. $7\frac{4}{5}$ .	3. $5\frac{5}{7}$	4. $10\frac{1}{20}$ .	5. $1\frac{1}{3}$ .	6. $1\frac{1}{6}$ .
7. $5\frac{3}{5}$ .	8. $1\frac{8}{3}$ .	9. $2\frac{8}{3}$ .	10. $2\frac{2}{5}$ .	11. $1\frac{3}{22}$ ...	
12. '845...	13. '816...	14. '790...	15. '763...	16. '577...	
17. '645...	18. 1 568...	19. '632...	20. 20 493...	21. 7 $\frac{2}{7}$ .	

## Examples. 110.

1. 2'236067...	2. 4'123105..	3. 27 602536...	4. '019598...
5. '774596...	6. 1'732050...	7. '264575..	8. 921954...
9. 87'286883...	10. '612372...	11. 15'414765...	12. 1'303840...
13. '845154...	14. 4 882304...	15. '030708...	16. 3 162277...

## Examples. 111.

1. 11.	2. 25.	3. 36.	4. 48.	5. 49.
6. 72.	7. 13.	8. 57.	9. 89.	10. 97.
11. 247.	12. 473.	13. 945.	14. 956.	15. 6031.
16. 551.	17. 9009.	18. 2222.	19. 45333.	20. 11111111.

## Examples. 112.

1. 26.	2. 51.	3. 79.	4. 401.	5. 265.	6. 197.
7. 957.	8. 101.	9. 4	10. $\frac{9}{13}$ .	11. $3\frac{2}{3}$ .	12. $19\frac{5}{8}$ .
13. 3.	14. 11.6.	15. 15.6.	16. $3\frac{3}{5}$ .	17. $2\frac{1}{4}$ .	18. 1.3.
19. 1.523...	20. 2.223...	21. 2.884...	22. 1.959...	23. 1.928...	24. 1.759...
25. 646...	26. 464...	27. 584...	28. 167...	29. 1.759...	30. 1.759...

## Examples. 113.

1. 1523913...	2. 2884499...	3. 1959172...
4. 125992...	5. 144224...	6. 2648751...

## Examples. 114.

1. 4.	2. 22.	3. 36.	4. 6.3.	5. 9.
6. 26.	7. 54.	8. 4.	9. 5.	10. 2434...

## Examples. 115.

1. 180 sq. ft.	2. 320 sq. ft.	3. 117 sq. ft.
4. 64 sq. ft. 106 in.	5. 78 sq. ft. $51\frac{3}{4}$ in.	6. 70 sq. yd. 8 ft.
7. 11 ft.	8. 2 ft. 4 in.	9. 99 yd.
11. 1067 sq. ft. 16 in.	12. 14 sq. yd. 81 in.	10. 8 ft. 9 in.
14. 18.	15. £136.8s.	16. £9 15s.
18. 556 sq. yd.	19. 15888.	20. £160. 15s.
21. $78\frac{1}{2}$ sq. yd. ; £1. 6s. 3d.	22. 4800 sq. ft.	23. 15 ft.
24. $21\frac{1}{2}$ sq. ft.	25. $1\frac{1}{2}$ in.	26. $27\frac{3}{4}$ in.
28. 26 yd. 2 ft.	29. 1024 sq. ft.	30. 300.
		31. £666. 12s.

## Examples. 116.

1. 220 yd.	2. 22 ft. 5 in.	3. 280 yd.	4. 50 yd.
5. 5656...yd.	6. 42'42...ft.	7. 18 ft.	8. 48 yd.
10. 77 yd. 2 ft. 11 in.		9. 34 yd.	

## Examples. 117.

1. 60 yd.	2. 37 yd. $1\frac{1}{2}$ in.	3. 60 yd. $1\frac{2}{3}$ in.
4. R44. 7a. $1\frac{1}{2}$ p.	5. £23. 1s. 3d.	6. 648 sq. ft.
7. 495 sq. ft.	8. 88 sq. yd. 6 ft.	9. 288 yd.
10. 96 yd.	11. 211 yd.	12. 176 yd. 2 ft. $1\frac{1}{2}$ in.
13. R46. 4a.	14. £17.	15. £5. os. $4\frac{1}{2}$ d.
16. $157\frac{1}{2}$ yd.	17. R1. 10a. $7\frac{1}{2}$ p.	18. 4s. $8\frac{3}{4}$ d.
20. $16\frac{1}{2}$ in.	21. R3499. 3a. 6p.	22. R114. 12a
24. R83. 14a. $10\frac{3}{4}$ p.	25. R19. 14a.	26. $5\frac{1}{8}$ .
27. Width, $18\frac{1}{2}$ ft. ; height, $14\frac{1}{2}$ ft.		28. R13. 6a.

## Examples. 118.

1. 12 bl.	2. 52 bl. 10 cot.
3. 108 bl. 7 cot. 8 ch.	4. 207 bl. 7 cot. 3 ch. 4 ga.
5. 357 bl. 9 cot. 3 ch. 4 ga.	6. 2427 bl. 8 cot.
7. 4992 bl. 10 cot. 16 ga.	8. 12188 bl. 19 cot. 14 ch. 8 ga.
9. 27 bl. 12 cot. 8 ch.	10. 8 bl. 1 cot. 4 ch.
11. 6 bl. 9 cot. 2 ch. 8 ga.	12. 19 bl. 12 cot. 11 ch. 4 ga.

## Examples. 119.

1. 400 cu. ft.	2. $183\frac{1}{2}$ cu. ft.	3. $157\frac{1}{2}$ cu. ft.
4. $8\frac{1}{2}$ cu. ft.	5. $4952\frac{6}{7}$ cu. ft.	6. $42\frac{7}{8}$ cu. ft.
7. $843\frac{3}{4}$ lb.	8. 10080.	9. 3750 times.
11. 24.	12. 1 ton 16 cwt.	13. 2800 times.
15. $62\frac{1}{2}$	16. $4\frac{1}{2}$ .	17. 16 ft. 9 in.
19. R1466. 10a. $8\frac{1}{2}$ p.	20. $16407\frac{207}{224}$ tons.	21. R170.
22. $133\frac{1}{2}$ .	23. 4 in.	24. 3 yd.
27. 60.	28. $15404\frac{1}{2}$ ft.	29. R5520.
		30. R276. 5a. 3p. ; 31440.

## Examples. 120.

1. 4 yd. $7\frac{5}{12}$ in.	2. 6 yd. 2 ft $8\frac{5}{16}$ in.
3. 1 sq. yd. 4 ft. 11 1/2 in.	4. 2 sq. yd. 4 ft $40\frac{3}{8}$ in.
5. 4 sq. yd. 4 ft. $12\frac{1}{2}$ in.	6. 2 sq. ft $26\frac{1}{2}$ in.
7. 1 cu. yd. 3 ft. 480 in.	8. 2 cu. yd. 20 ft. 1048 in.
9. 10 cu. ft. $300\frac{1}{2}$ in.	10. 3 cu. ft. $471\frac{3}{8}$ in.

11. 8 ft. 7".	12. 34 ft. 7". 6".
13. 8 ft. 11". 6". 8".	14. 10 ft. 9". 10". 6".
15. 56 sq. ft. 5". 11". 6"".	16. 70 sq. ft. 5". 0". 4". 6".
17. 62 cu. ft. 1' 0". 6". 8 <sup>iv</sup> .	18. 28 cu. ft. 1' 8". 0"". 5 <sup>iv</sup> . 4".

### Examples. 121.

1. 7 sq. ft. 72 in.	2. 67 sq. ft. 12 in.
3. 132 sq. ft. 117 in.	4. 217 sq. ft. 14 in.
5. 316 sq. ft. 36 in.	6. 129 sq. ft. 54 in.
7. 98 sq. ft. 80 $\frac{1}{2}$ in.	8. 130 sq. ft. 140 in.
9. 228 sq. ft. 83 $\frac{7}{8}$ in.	10. 2459 sq. ft. 107 $\frac{4}{5}$ in.
11. 38 cu. ft. 1161 in.	12. 127 cu. ft. 304 in.
13. 874 cu. ft. 1510 $\frac{1}{2}$ in.	14. 471 cu. ft. 585 $\frac{3}{4}$ in.
15. 3309 cu. ft. 453 $\frac{11}{12}$ in.	

Examples. 122.

1. 6a.	2. R2. 8a.	3. 4a.	4. 2 md. 20 seers.	5. 2 ft.
6. 7s. 5 <i>1</i> <sub>3</sub> <sup>1</sup> d.	7. 5 <i>p.</i>	8. R35. 12a.	9. 5s. 10 <i>d.</i>	10. 36 <i>8</i> <sub>1</sub>
11. 34 <i>1</i> <sub>3</sub> <sup>1</sup> mi.	12. 5 <i>2.</i> 12s. 6 <i>d</i>		13. 5 <i>a.</i>	14. R21.

### Examples. 123.

1. 30 da.	2. 60.	3. 270 da.	4. 700 mi.	5. 91.
6. $4\frac{1}{2}$ da.	7. 7.	8. $4\frac{1}{2}$ da.	9. 11.	
10. 4 md.	11. 270.	12. 270.	13. 2.	

### Examples. 124.

1.	R2079.	2.	R20.	3.	R15. 12a.	4.	R650.
5.	£10. 10s.	6.	R48. 7a.	7.	240.	8.	48.
9.	£12. 13s. 10.	10.	36 lb.	11.	R8 12a.	12.	R9. 11a. 4 <i>1</i> <sup>1</sup> <sub>2</sub>
13.	20.	14.	8 <i>1</i> <sup>1</sup> <sub>2</sub> d.	15.	£2. 6s. 8 <i>1</i> <sup>1</sup> <sub>2</sub> d.	16.	7a. 6 <i>1</i> <sup>1</sup> <sub>2</sub> d.
17.	R3937. 8a.	18.	£816. 16s.	19.	R17640.	20.	R240.
21.	R472. 13a. 7 <i>1</i> <sup>1</sup> <sub>2</sub> d.	22.	7 <i>1</i> <sup>1</sup> <sub>2</sub> da.	23.	R31. 14a.	24.	£1. 8s.
25.	R168.	26.	11s. 3d.	27.	£3. 12s.	28.	14a. 8 <i>1</i> <sup>1</sup> <sub>2</sub> d.
29.	94 <i>1</i> <sup>1</sup> <sub>2</sub> .	30.	21 <i>1</i> <sup>1</sup> <sub>2</sub> md.	31.	R937. 8a.	32.	17 <i>1</i> <sup>1</sup> <sub>2</sub> days.
33.	16 <i>1</i> <sup>1</sup> <sub>2</sub> .	34.	4618.	35.	117 <i>1</i> <sup>1</sup> <sub>2</sub> .	36.	391 <i>1</i> <sup>1</sup> <sub>2</sub> yd.
37.	40 <i>1</i> <sup>1</sup> <sub>2</sub> .	38.	12 <i>1</i> <sup>1</sup> <sub>2</sub> s.	39.	433 <i>1</i> <sup>1</sup> <sub>2</sub> .	40.	R36.

41. 190 $\frac{5}{7}$ . 42. R7. 6a. 6 $\frac{2}{3}$ pt. 43. 15. 44. 12. 45. R60.  
 46. 100 grains. 47. 8 $\frac{8}{13}$ . 48. R390. 49. R1. 50. 1 lb. 8 oz.

Examples. 125.

1. 6.	2. 6.	3. 8.	4. 15.	5. 10.
6. 11 md.	8 seers.	7. 4.	8. 2 hr. 40 min.	9. 12 oz.
10. 9s.		11. 48.	12. 180 days.	13. 46 $\frac{2}{3}$ days.
14. 41 $\frac{2}{3}$ days.		15. 4.	16. 6 months.	17. 35 $\frac{5}{14}$ .

Examples. 126.

1. 2.	2. 5.	3. 3.	4. 7.	5. 50.	6. 67 $\frac{1}{2}$ .
7. 22 $\frac{2}{3}$ .	8. 32.	9. 10 $\frac{1}{2}$ .	10. 50.	11. 8 $\frac{1}{2}$ .	12. 53 $\frac{1}{3}$ .
13. 75.	14. R4.	15. 23 $\frac{1}{2}$ .	16. 60 yd.	17. 7 $\frac{1}{2}$ lb.	
18. 25. 4d.	19. 8.	20. 10a.	21. 10 $\frac{2}{3}$ .	22. 15.	

Examples. 127.

1. 6.	2. 3 $\frac{1}{2}$ .	3. 11 $\frac{1}{2}$ .	4. 30 $\frac{4}{5}$ .	5. 24.
6. 3.	7. 16.	8. 33 $\frac{6}{13}$ .	9. 26 $\frac{8}{17}$ .	10. 10.
11. R12. 3a.	12. R80.	13. 16 days.	14. R118. 12a.	

Examples. 128.

1. R93 12a.	2. £471. 1s.	3. R171. 14a.	4. 10a.
5. 2a. 8d.	6. 3d	7. R2967. 3a.	8. £4000.
9. R1920.	10. £396 12s.	11. R2880.	12. £180.
13. £722. 13. 4.	14. 3d.	15. 4 $\frac{1}{2}$ .	16. £3200.
		16. 4 $\frac{1}{2}$ .	17. £3000.

Examples. 129.

1. 4 $\frac{1}{2}$ hr	2. 1 $\frac{28}{37}$ da.	3. 1 $\frac{47}{163}$ hr	4. 4 da.; A $\frac{2}{3}$ , B $\frac{1}{3}$ , C $\frac{4}{15}$ .
5. 12 da.	6. 1 hr.	7. 7 $\frac{1}{17}$ min.	8. 4 $\frac{1}{2}$ hr.
9. A, 20 $\frac{4}{13}$ da., B, 8 $\frac{1}{3}$ , C, 7 $\frac{1}{2}$ .	10. 2 $\frac{14}{163}$ da.	11. 18 da.	
12. 13 $\frac{1}{3}$ da.	13. 120 da.	14. 4 $\frac{1}{2}$ da.	15. Each in 60 da.
16. 7 $\frac{2}{3}$ .	17. 5 $\frac{155}{21}$ hr.	18. 12 hr.	19. 16.
20. 6 $\frac{1}{2}$ .	21. At 10.	22. 32.	23. 25 da.
24. 76.	25. 12 $\frac{2}{7}$ min.	26. 4 hr.	27. 56 $\frac{2}{3}$ da.

## Examples. 130.

1. 2 h.  $39\frac{7}{8}$  m. P. M.
2. 2 h.  $48\frac{9}{32}$  m. P. M.
3. 9 P. M., Friday.
4. After 112 da. 12 hr. (true time); first, 7 h.  $48\frac{3}{4}$  m. P. M.; second, 8 h.  $18\frac{1}{2}$  m. P. M.
5. 8 h.  $47\frac{48}{577}$  m. A. M.
6. The slower must be put on  $13\frac{1}{3}$  min.; or the faster put back  $13\frac{2}{3}$  min.
7. 3 P. M., Dec. 3.
8. 9 min.
9.  $\frac{1}{2}$  min.
10. 4 P. M.
11. Tuesday, 4 P. M.
12.  $1\frac{5}{6}$  min. past 9.
13. Tuesday next, 4 h.  $54\frac{1}{2}$  m. P. M. and 4 h.  $32\frac{1}{2}$  m. P. M.
14.  $10\frac{19}{30}$  min. past 6.
15.  $\frac{1}{2}$  sec.
16. 1 h.  $50\frac{70}{103}$  m. P. M.
17. On March 13, at the same hour at which it was put right.
18. 5 da. ago, at the same hour; after 235 da. at the same hour.
19.  $2\frac{2}{8599}$  min.

## Examples. 131.

1. (i)  $10\frac{19}{11}$  min. past 2; (ii)  $27\frac{8}{11}$  min.; (iii)  $43\frac{7}{11}$  min.;  
(iv) 24 min.; (v)  $34\frac{9}{11}$  min., and  $52\frac{4}{11}$  min.
2. (i)  $16\frac{4}{11}$  min. past 3; (ii)  $32\frac{8}{11}$  min.; (iii)  $49\frac{7}{11}$  min.;  
(iv)  $3\frac{3}{11}$  min., and  $29\frac{5}{11}$  min.; (v)  $40\frac{4}{11}$  min., and  $57\frac{9}{11}$  min.
3. (i)  $32\frac{8}{11}$  min. past 6; (ii)  $16\frac{4}{11}$  min., and  $49\frac{7}{11}$  min.;  
(iii) no time, (iv)  $19\frac{7}{11}$  min., and  $45\frac{9}{11}$  min.;  
(v)  $8\frac{8}{11}$  min., and  $56\frac{8}{11}$  min.
4. (i) no time; (ii)  $16\frac{4}{11}$  min., and  $49\frac{7}{11}$  min. past 12;  
(iii)  $32\frac{8}{11}$  min.; (iv)  $13\frac{1}{11}$  min., and  $52\frac{4}{11}$  min.;  
(v) 24 min., and  $41\frac{5}{11}$  min.
5. (i)  $38\frac{2}{11}$  min. past 7; (ii)  $21\frac{9}{11}$  min., and  $54\frac{6}{11}$  min.;  
(iii)  $5\frac{5}{11}$  min.; (iv)  $25\frac{1}{11}$  min., and  $51\frac{8}{11}$  min.; (v)  $14\frac{1}{11}$  min.
6. (i)  $54\frac{6}{11}$  min. past 10, (ii)  $5\frac{5}{11}$  min., and  $38\frac{2}{11}$  min.;  
(iii)  $21\frac{1}{11}$  min.; (iv)  $2\frac{2}{11}$  min., and  $41\frac{5}{11}$  min.,  
(v)  $13\frac{1}{11}$  min., and  $30\frac{6}{11}$  min.
7.  $22\frac{3}{35}$  min. past 2.
8.  $27\frac{548}{577}$  min. past 5.
9.  $41\frac{49}{481}$  min. past 5.
10.  $4\frac{4}{11}$  min. past 12.
11.  $\frac{1}{2}$  min. div. put back.
12. Gains  $56\frac{8}{77}$  min.

## Examples. 132.

1. In 45 sec.
2.  $41\frac{7}{11}$  mi.
3. At 7-30 P. M.; 300 mi. from Cal.
4. At 5 h.  $34\frac{2}{7}$  m. A. M.;  $25\frac{1}{7}$  mi. from Cal.
5.  $4\frac{4}{5}$  sec.

6. 36 sec. 7.  $3\frac{1}{2}$  and  $1\frac{1}{2}$  mi. per hr. 8. 1 hr.  $26\frac{5}{18}$  min.  
 9. 150 yd. 10. 11 h.  $38\frac{4}{7}$  m. A. M. 11.  $119\frac{1}{2}$  mi.  
 12. 12 mi. from Cal. 13. 7 miles.  
 14. 5 min.  $24\frac{10}{11}$  sec. after *B* starts. 15. 9 h  $9\frac{3}{18}$  m. A. M.  
 16. 240 mi. 17. 6 mi. and 5 mi. per hr. 18. 7 mi. 18a.  $11\frac{1}{4}$  mi.  
 19. 9 hr.  $37\frac{8}{11}$  min. 20. 10 hr. 46 min. 21. 46.  
 22. 16 min. 42 sec. 23. 3 hr. 55 min. 24. 28 min.

## Examples. 133.

1. (i) 10 hr.; (ii)  $1\frac{8}{7}$  hr. 2. (i)  $7\frac{1}{2}$  hr.; (ii)  $1\frac{7}{8}$  hr. 3.  $31\frac{1}{2}$  da.  
 4. 300 da.; 300 da. 5. 3 hr.; 6 hr.

## Examples. 134

1.  $5\frac{5}{18}$  min. 2.  $79\frac{1}{4}$  yd. 3. 80 yd.  
 4. 9 mm. 36 sec. 5. *C* can give *B* 5 points.  
 6. *B* wins by 126 yd. 2 ft. and by 1 min. 16 sec.  
 7. 5. 8. *C* wins by  $60\frac{7}{8}$  yd.  
 9. *A*, 1 min.  $15\frac{17}{60}$  sec.; *B*, 1 min.  $20\frac{1}{2}$  sec., *C*, 1 min. 23 sec.  
 10. *A* wins by  $68\frac{8}{60}$  yd. 11. 9.  
 12. *A* in  $16\frac{24}{125}$  sec.; *B*,  $17\frac{5}{6}$  sec.; *C*,  $18\frac{2}{5}$  sec.  
 13. 176 yd. 14. 5.  
 15. *A* in 15 min. 50 sec.; *B* in 16 min. 20 sec.; *C* in 16 min. 40 sec.  
 16. *C* wins by  $3\frac{16}{21}$  yd.

## Examples. 135.

1.  $18\frac{1}{60}$ . 2.  $6a. 10\frac{14}{15}b.$  3. 100. 4. R2. 4a  $6\frac{4}{5}b.$  5.  $19\frac{5}{6}$ .  
 6. 1885. 7.  $10\frac{5}{24}$  da. 8.  $3\frac{1}{7}$  da. 9. 32. 10. 10a.

## Examples. 136.

1. 10. 2. 45. 3. 264. 4. 75. 5. 8. 6.  $10\frac{10}{27}$ .  
 7. R37. 8a. 8. 30 9. R24. 4a  $10\frac{5}{6}b.$  10. 21 mo.  
 11. 8. 12. 6. 13.  $43\frac{1}{2}$  da. 14. 120.  
 15.  $6\frac{9}{11}$  oz. 16. 15. 4d. 17. 10s 8d. 18.  $8\frac{1}{3}$ .  
 19. 27. 20. 9. 21. 25. 22. 10.  
 23.  $13\frac{1}{2}$ . 24.  $4\frac{1}{2}$ . 25.  $6\frac{2}{3}$  oz. 26. £98. 5s.

27. 8.      28. 4.      29. 7.      30. 4.  
 31. 8.      32.  $30\frac{3}{8}$ .      33.  $R20.7a.9\frac{1}{8}d.$  34. 75 ac.  
 35.  $19\frac{1}{2}$  oz.      36. 20.      37. 3.

## Examples. 137.

1.  $R20.$       2.  $R3; R4.$       3. 180 gr.;  $87\frac{3}{11}$  gr.      4.  $R13.$   
 5.  $R5; R20.$  6. 48 da.      7. 28 da.      8.  $54\frac{6}{11}$  da. 9. 4 da.  
 10. A man in  $7\frac{1}{2}$  hr.; a boy, 18 hr.; a man and a boy in  $5\frac{1}{2}$  hr.  
 11. 6.      12. 10 hr.

## Examples. 138.

1.  $\frac{5}{7}.$       2.  $\frac{3}{8}.$       3.  $\frac{6}{11}.$       4.  $\frac{4}{5}.$       5.  $\frac{14}{17}.$       6.  $\frac{25}{36}.$   
 7.  $\frac{3}{5}.$       8.  $\frac{8}{5}.$       9.  $\frac{9}{8}.$       10.  $5:4.$  11.  $1:4.$  12.  $1:1.$   
 13.  $1:4.$       14.  $7:8$  is greater.      15.  $18:29$  is greater.  
 16. 4 : 5 greatest, 2 : 3 least.      17.  $7:11$  greatest, 3 : 7 least.  
 18. Yes.      19. No.      20. Yes.      21.  $10\frac{2}{7}.$  22.  $5\frac{1}{2}.$   
 23. '0002.      24. 18 lb.      25.  $\mathcal{L}1.6s.8d.$       26. 45 men.  
 27.  $\mathcal{L}2.5s.$       28. 30 hr.      29. 75.      30. 14.      31. 39.  
 32. 7280.      33.  $\frac{5}{7}r.$       34.  $3\frac{1}{4}.$       35. '06.      36. 25.  
 37.  $4\frac{1}{2}.$       38.  $12a.6d.$  39.  $17:10.$       40.  $27:64.$   
 41.  $2:1.$       42.  $192:240:280:315.$       43.  $\mathcal{L}2.5s.8\frac{4}{7}d.$   
 44. 18500 oz. 45. 33 ft.      46.  $15:16.$       47.  $\mathcal{L}32.$   
 48. 30 gall., 20 gall.      49. 40 gall.      50.  $16:15.$

## Miscellaneous Examples. 139.

1. 17.      2.  $R204.$       3.  $3^3.5.7^2.11^2.13^3:5.$       4.  $\frac{163}{210}$   
 5.  $R369.2a.3d$       6. 18.      7. 9996 and 1020.  
 8.  $R65.15a.6d.$  9. 8.      10. 25.      11.  $\mathcal{L}269.1s.9\frac{1}{2}d.$   
 12. 1584 lb. 13. 3020 men; 2700 women. 14.  $R151.2a.$   
 15. 63 times. 16.  $3\frac{3}{11}.$       17. 123.      18.  $\mathcal{L}1.10s.$  19. 84.  
 20.  $R8.2a.6\frac{1}{2}d.$  to each of 5;  $R4.1a.3\frac{1}{2}d.$  to each of the others.  
 21. 13.      22. '0203125.      23. '016.      24.  $14\frac{7}{8}.$   
 25. 6.      26. 720.      27. 162 dollars.      28.  $13\frac{1}{2}$  gall.  
 29. 112 sq. yd. 7 ft.      30.  $4\frac{23}{28}$  hr.      31. 50 years.  
 32. 10 seers. 34. '083.      35.  $R110.4a.; 1$  ft. 36. 3a.  
 37.  $\frac{5310}{2698}.$       38. The first person gains  $R1.11a.6\frac{1}{2}d.$  more.

39. 455. 40.  $\frac{80}{1}$ ;  $\frac{1}{18}$ . 41.  $1\frac{2}{3}$  ft. 42. R5888.  
 43. 14. 44. 4. 45. 40 grains. 46. 6552.  
 47. 9600. 48. R2790. 10a.;  $\frac{8955}{1152}$ . 49. R14.  
 50. £22. 18s.; £7. 12s. 8d. 51. 42 boys, 20 fruits. 52.  $\frac{1}{3}$ .  
 53. 4 sq. ft. 18 in. 54.  $13\frac{1}{3}$  da. 55. R3600.  
 56. £1. 7s. 1d. and 4d. 57. 55 min. 58. 27 i.  
 59. R1. 10a. 6s.; R1. 9a. 7 $\frac{1}{2}$ s. 60.  $9\frac{3}{4}$  weeks, £341. 5s.  
 61. 4 gall. 62.  $3\frac{3}{4}$  hr. 63. 11 P. M.  
 64. 1 P. M., 120 mi. from Cal. 65. 172800. 66. 39.  
 67.  $13\frac{3}{4}$ s. 10 $\frac{1}{2}$ d.;  $\frac{87}{12}$ . 68. After  $12\frac{1}{2}$  min. 69. R2120.  
 70. £2. os. 8d. 71.  $2\frac{1}{2}$  mi. 72. 128.  
 73. 14, 28; 42. 74. 42 ft. 75.  $14\frac{2}{3}$  da.  
 76. Monday, 12 h. 8 m. P. M.; 11 h. 56 m. A. M. 77. 66 yd.  
 78. R2560. 79.  $59\frac{1}{2}$ . 80. 14 yd.; 7 yd., 2 yd 2 ft  
 81. 1-15 o'clock. 82. 2250. 83.  $1\frac{1}{2}$  mi., 2 hr.  
 84. 8 mi. per hr. 85. 16 lb. 86.  $2\frac{2}{3}$  hr. 87. 1008.  
 88. 72. 89. 45. 90. 6 : 5. 91.  $18\frac{7}{8}$ . 92. 5.  
 93.  $55\frac{1}{2}$  sec. 94.  $20\frac{2}{3}$  yd. 95. 10. 96. 29 of wine to 41 of water.  
 97. A, R5. 4a.; B, R17. 12a.; C, R24.  
 98.  $4\frac{1}{11}$  and  $16\frac{9}{11}$  min. past 2. 99.  $30\frac{5}{12}$  sec. 100. 18.  
 101. A cow, £1; a sheep, 5s. 102. 7 : 17. 103.  $\frac{1}{6}$ .  
 104. 7 $\frac{1}{2}$ . 105. 4 mi. per hr. 106. B wins by  $\frac{1}{4}$  yd.  
 107. 4 da. 108. 2 oz. 109. 2 gall.  
 110.  $392\frac{1}{4}$ . 111. 55 min. 112. 5 min. 15 sec.  
 113. 152 da. 114. 4 gall. 115. £491. 8s  
 116. A in 36 days; B, 48; C,  $28\frac{4}{5}$ . 117. 20 mi. per hr.  
 118. 360 sec. 119. 15. 120. 2 : 1.

## Examples. 140.

1. R1. 9a., R3. 2a., R4. 11a., R6. 4a.  
 2. £8. 2s., £6. 15s., £2. 14s., 18s. 3. 7,  $4\frac{1}{2}$ ,  $6\frac{1}{4}$ ,  $7\frac{5}{6}$  tons.  
 4. 75, 100,  $112\frac{1}{2}$ , 120, 125. 5. £3, £1. 17. 6. 6. R106.  
 7. £66; £71. 10s. 8.  $100\frac{1}{2}$  lb. 9. 250 lb. 10. 50,000.  
 11. R40, R30, R20. 12. R12, R16, R8. 13. R240, R80, R40.  
 14. R18, R6, R8. 15. £8, £6. 16. 12, 10, 8.

17. R6, R10, R5. 18. 5s. 7½d., 7s. 3½d., 1s. 8½d., 18s. 9d.  
 19. Each man 5s., each woman 3s., each boy 2s. 20. R2. 8a.  
 21. Men 27s., women 27s., children 11s. 3d. 22. £18, £12, £9.  
 23. ½ cwt. 24. 20, 30, 40, 50. 25. 50  
 26. 40 rupees, 48 eight-anna pieces, 64 four-anna pieces.  
 27. Each man R2. 8a., each woman R1, each child R½.  
 28.  $\frac{2}{3}, \frac{3}{5}, \frac{1}{2}$ . 29. R70, R42, R30.  
 30. The radii are  $\frac{1}{\sqrt{3}}$  and  $\frac{\sqrt{2}}{\sqrt{3}}$  ft. 31. 180 gr.  
 32. R25000. 33. 57.

Examples. 141.

1. R70, R100, R150. 2. R780, R520. 3. £1200.  
 4. R4500, R3000, R3000. 5. R3372. 8a. 6. £480, £360, £240.  
 7. £17. 10s., £15, £12. 8. R7, R6, R4. 8a. 9. £286, £163, 16s.  
 10. R483½, R498½, R218½. 11. £100.  
 12. £366. 13. R168. 12a. 14. 30.

Examples. 142.

1. In the ratio of 3 to 1. 2. 8 : 5. 3. In the ratio of 9 to 11.  
 4. 197 : 180. 5. In the ratio of 33 : 2. 6. 1 : 4  
 7. 8½ lb. of each. 8. 25 md. at R3, 35 md. at R2. 4a.  
 9. 4½ gall. 10. 20 : 7 ; 5s. 1½d. 11. In proportion of 3, 5, 2, 2.  
 12. In proportion of 1, 1, 5. 13. 10 gall.  
 14. In proportion of 4, 6, 9. 15. In proportion of 52, 78, 51, 68.

Examples. 143.

1. 3. 2. 13½. 3. 7½. 4. 4·34. 5. 11½. 6. R4. 8a  
 7. 125. 8. £2. 19. 4½. 9. 10 st. 10. R4. 8. 9½.  
 11. 8½ mi. 12. 10½ st. 13. 14 yr. 14. 43 yr. 15. 8½ st  
 16. 11 yr. 17. R5. 11a. 18. R7. 19. 63°, 75°.

Examples. 144.

1.  $\frac{1}{5}$  2.  $\frac{1}{3}$  3.  $\frac{1}{200}$  4.  $\frac{3}{500}$  5.  $\frac{1}{2}$ . 6. R35.  
 7. £10, 10s. 8. 3s. 9. 1218. 10.  $\frac{1}{3}a$  sq. in.

11. 4 cwt. 1 qr.      12. R750.      13. 35929.  
 14. £600.      15. 15. 7 $\frac{1}{2}$ .      16. £450.

## Examples. 145.

1. 25 p. c.      2. 16 $\frac{2}{3}$  p. c.      3. 3 $\frac{1}{2}$  p. c.      4. 40 p. c.  
 5. 42 $\frac{2}{3}$  p. c.      6. 35 p. c.      7. 88 $\frac{2}{3}$  p. c.      8. 19 $\frac{1}{2}$  p. c.  
 9. 468 $\frac{1}{4}$  p. c.      10. 138 p. c.      11. 50 p. c.      12. 20 p. c.  
 13. 20 p. c.      14. 57 $\frac{1}{2}$  p. c.      15. 210 p. c.      16. 50 p. c.  
 17. 87 $\frac{1}{2}$  p. c.      18. 24 p. c.      19. 12 $\frac{1}{2}$  p. c.  
 20. Nitre 75 p. c., sulphur 10, and charcoal 15.      21. 8 $\frac{1}{2}$  p. c.

## Examples. 146.

1. 220.      2. 1200.      3. 25.      4. 10800.      5. 100.  
 6. 1296 $\frac{5}{7}$ .      7. R4875.      8. R5000.      9. 13000.      10. R78. 2a.

## Miscellaneous Examples. 147.

1. 10a.      2. R8000.      3. R4545 $\frac{5}{11}$ .      4. 128.      5. R1531 $\frac{11}{18}$ .  
 6. 35 p. c.      7. 54 $\frac{2}{3}$  p. c.      8. 2 $\frac{2}{3}$  1 $\frac{1}{2}$  p. c. decrease.      9. 50 lb.  
 10. 9 $\frac{1}{11}$  p. c.      11. 18 $\frac{5}{11}$  p. c.      12. 9 $\frac{1}{11}$  p. c.

## Examples. 148.

1. R175.      2. £245      3. R75 $\frac{1}{2}$ .      4. R7003. 2a.  
 5. R38000.      6. £914 $\frac{2}{3}$ .      7. R3000.      8. £101. 10. 7 $\frac{1}{2}$ .  
 9. R10000.      10. £260.      11. £5154 $\frac{6}{7}$ ; £154 $\frac{6}{7}$ .

## Examples. 149.

1. 25 p. c.      2. 25 p. c.      3. 25 p. c.      4. 33 $\frac{1}{2}$  p. c.  
 5. 8 $\frac{1}{2}$  p. c. loss      6. 71 $\frac{2}{3}$  p. c. gain.      7. 33 $\frac{1}{2}$  p. c.  
 8. R80, 1a. 10 $\frac{1}{2}$ .      9. 1s 5 $\frac{1}{2}$ d. 10. 12.      11. 9s. 4 $\frac{1}{2}$ d.  
 12. 2s. 3 $\frac{2}{3}$ d. 13. 12 $\frac{1}{2}$  p. c.      14. 2 $\frac{2}{3}$ a.      15. R500.  
 16. 8 md.      17. 143 for R12.      18. R2320 $\frac{2}{3}$  19. R320.  
 20. 2s.      21. R2. 0. 4 $\frac{1}{2}$       22. 8.      23. 6 p. c. gain.  
 24.  $\frac{1}{2}$  p. c. gam. 25. 50 p. c.      26. 2 $\frac{2}{3}$ d.      27. Loses 16 p. c.  
 28. 17 p. c.      29. 26 $\frac{6}{7}$  p. c.      30. 16 $\frac{2}{3}$  p. c.      31. R150

32. R $22\frac{2}{3}$  33. 25 yd. 34. Gains 30 $\frac{1}{2}$  p. c.  
 35. 4 for 3a.; 512. 36. 1 lb to 2 lb. 37. 2a. 36.  
 38. 17 $\frac{1}{2}$  p. c.; 2 : 1. 39. R $23.5\cdot 4$  40. 19 : 12.  
 41. 1 : 2. 42. 21 p. c. 43. R $460$ . 44. 33 $\frac{1}{2}$  p. c.

## Examples. 150.

1. R $7.4a$ . 2. R $21.6a$ . 3. R $45$ .  
 4. R $263.10.9$ . 5. R $11.12.6$ . 6. R $270$ .

## Examples. 151.

1. R $24$ . 2. £ $60$ . 3. R $315$ . 4. £ $57.12s$   
 5. R $222.12a.6$ . £ $112$ . 7. R $40.15.8\frac{1}{2}$ ; R $536.1.8\frac{1}{2}$ .  
 8. £ $32.10.6$ ; £ $357.15.6.9$ . R $108.5.7\frac{1}{2}$ ; R $334.1.4\frac{1}{2}$ .  
 10. R $285$ . 11. £ $372.8s$ . 12. R $440.8.4\frac{1}{2}$ .  
 13. £ $763.13.0\frac{1}{2}$ . 14. £ $405.4.1\frac{1}{2}\frac{1}{2}$ . 15. £ $226.1.11$ .

## Examples. 152.

1. R $33.5.4$ . 2. £ $100$ . 3. £ $157.10s$ .  
 4. R $5.12.6$ . 5. R $2.0.3$ . 6. R $3.14.7$ .

## Examples. 153.

1. £ $2.8s$ . 2. R $20.4a$ . 3. R $4.13.1\frac{1}{2}s$ .  
 4. £ $5.4.6\frac{1}{2}r$ . 5. R $6.14.1\frac{1}{2}\frac{1}{2}s$ . 6. R $9.14.7\frac{1}{2}s$ .

## Examples. 154.

1. 2 $\frac{1}{2}$ . 2. 3 $\frac{1}{2}$ . 3. 3 $\frac{1}{2}$ . 4. 3 $\frac{1}{2}$ .  
 5. 5. 6. 3 $\frac{1}{2}$ . 7. 2 $\frac{1}{4}$ . 8. 64.

## Examples. 155.

1. 3 yr. 2. 3 $\frac{1}{2}$  yr. 3. 3 $\frac{1}{2}$  yr. 4. 4 yr. 9 mo.  
 5. 2 yr. 3 mo. 24 da. 6. 97 days. 7. 64 yr. 8. 3 yr.  
 9. 5 yr. 10. 15th April. 11. 16 mo.

## Examples. 156.

1. R $750$ . 2. R $4266.10.8$ . 3. £ $170.6.3$ . 4. £ $1050$ .  
 5. R $400$ . 6. R $750$ . 7. R $800$ . 8. R $150$ .  
 9. £ $265.10$ . £ $33.13.4.11$ . 11. R $672.4.4.12$ . £ $1022.14.7$ .

## Miscellaneous Examples. 157.

1. 6 $\frac{1}{2}$ . 2. R500. 3. R570. 4. 3 yr. 5. 10 yr.  
 6. 6 p. c. 7. R9733.5 4. 8. R400; 7 $\frac{1}{2}$  9. 8 $\frac{3}{4}$  yr.  
 10. R533.5. 4. 11. £190. 12. £30000. 13. R19200. 14. 40 yr.

## Examples. 158.

1. R41. 2. R42.6. 11. 3. R38.6.6. 4. R141.2.8.  
 5. £731.3.3.6. £343.4.5. 7. £641.6.3. 8. £260.9.1.  
 9. R14.2.2 $\frac{2}{3}$ . 10. £31.18.9 to the nearest penny.

## Examples. 159.

1. R1102.8a. 2. R327.13.1. 3. R772.4.2.  
 4. R855.14a. 5. R2184.13.4. 6. R4328.7.7.  
 7. R1.0.10. 8. R11.1.7. 9. R3278.2.11.  
 10. R375.3.11. 11. £90 14.1 to the nearest penny.  
 12. £120. 13. £250. 14. £3125.  
 15. £815.3.3 to the nearest penny.  
 16. 15s. to the nearest penny.

## Miscellaneous Examples. 160

1. R2432. 4. R625 5. R3310.2a.  
 6. 85184. 7. R10000. 8. R5000.

## Examples. 161.

1. R170. 2. R1250. 3. R3562.8a. 4. £1337.10s.  
 5. £1416.13.4. 6. £1005.6.8. 7. R1600.  
 8. R182.8a. 9. R20000. 10. £1000.

## Examples. 162.

1. R5.4a. 2. R80.3.4. 3. R151.14a.  
 4. R105.6.8. 5. £20 4.8 $\frac{1}{2}$ . 6. £17.8.2 $\frac{2}{3}$ .  
 7. £4.2.4. 8. £1 15s. 9. R708.12a.  
 10. R482.14.8. 11. R1077.8.6. 12. £38.8.9.  
 C. A. 32

## Examples 163

1. ~~pass~~ ~~the~~ 2. ~~the~~ ~~the~~ 3. ~~the~~ ~~the~~ 4. ~~the~~ ~~the~~  
 5. ~~the~~ ~~the~~ 6. ~~the~~ ~~the~~ 7. ~~the~~ ~~the~~ 8. ~~the~~ ~~the~~

## Examples 164

1. ~~the~~ ~~the~~ 2. ~~the~~ ~~the~~ 3. ~~the~~ ~~the~~ 4. ~~the~~ ~~the~~  
 5. ~~the~~ ~~the~~ 6. ~~the~~ ~~the~~ 7. ~~the~~ ~~the~~ 8. ~~the~~ ~~the~~

## Examples 165

1. ~~the~~ ~~the~~ 2. ~~the~~ ~~the~~ 3. ~~the~~ ~~the~~  
 4. ~~the~~ ~~the~~ 5. ~~the~~ ~~the~~ 6. ~~the~~ ~~the~~  
 7. ~~the~~ ~~the~~ 8. ~~the~~ ~~the~~ 9. ~~the~~ ~~the~~  
 10. ~~the~~ ~~the~~ 11. ~~the~~ ~~the~~ 12. ~~the~~ ~~the~~  
 13. ~~the~~ ~~the~~ 14. ~~the~~ ~~the~~ 15. ~~the~~ ~~the~~  
 16. ~~the~~ ~~the~~ 17. ~~the~~ ~~the~~ 18. ~~the~~ ~~the~~  
 19. ~~the~~ ~~the~~ 20. ~~the~~ ~~the~~ 21. ~~the~~ ~~the~~ 22. ~~the~~ ~~the~~ to the reverse

## Examples 166

1. ~~the~~ ~~the~~ 2. ~~the~~ ~~the~~ 3. ~~the~~ ~~the~~ 4. ~~the~~ ~~the~~  
 5. ~~the~~ ~~the~~ 6. ~~the~~ ~~the~~ 7. ~~the~~ ~~the~~ 8. ~~the~~ ~~the~~  
 9. ~~the~~ ~~the~~ 10. ~~the~~ ~~the~~ 11. ~~the~~ ~~the~~ 12. ~~the~~ ~~the~~

## Examples 167

1. ~~the~~ ~~the~~ 2. ~~the~~ ~~the~~ 3. ~~the~~ ~~the~~ 4. ~~the~~ ~~the~~ 5. ~~the~~ ~~the~~

## Examples 168

1. ~~the~~ ~~the~~ 2. ~~the~~ ~~the~~ 3. ~~the~~ ~~the~~ 4. ~~the~~ ~~the~~  
 5. ~~the~~ ~~the~~ 6. ~~the~~ ~~the~~ 7. ~~the~~ ~~the~~ 8. ~~the~~ ~~the~~ 9. ~~the~~ ~~the~~  
 10. ~~the~~ ~~the~~ 11. ~~the~~ ~~the~~ 12. ~~the~~ ~~the~~ 13. ~~the~~ ~~the~~

## Examples 169

1. ~~the~~ ~~the~~ 2. ~~the~~ ~~the~~ 3. ~~the~~ ~~the~~ 4. ~~the~~ ~~the~~  
 5. ~~the~~ ~~the~~ 6. ~~the~~ ~~the~~ 7. ~~the~~ ~~the~~ 8. ~~the~~ ~~the~~  
 9. ~~the~~ ~~the~~ 10. ~~the~~ ~~the~~ 11. ~~the~~ ~~the~~ 12. ~~the~~ ~~the~~ 13. ~~the~~ ~~the~~  
 14. ~~the~~ ~~the~~ 15. ~~the~~ ~~the~~ 16. ~~the~~ ~~the~~ 17. ~~the~~ ~~the~~ 18. ~~the~~ ~~the~~

15. £30,500

18. 93 $\frac{1}{4}$ .

16. £22,500.

19. 129 $\frac{7}{8}$ .

17. £7200.

20. 78 $\frac{8}{9}$ .

## Examples. 170.

1. 4 $\frac{4}{5}$  p. c. 2 4 $\frac{5}{8}$  p. c. - 3. 3 $\frac{1}{2}$  p. c. 4. 3 $\frac{8}{9}$ . 5. 72 $\frac{8}{11}$ .  
 6. 74 $\frac{7}{8}$ . 7. 99. 8. 86 $\frac{1}{2}$ . 9. 4 $\frac{47}{128}$  p. c. 10. The latter.  
 11. The former. 12. 11 p. c. 13. £7040. 14. £3400.

## Miscellaneous Examples. 171.

1. 17 $\frac{1}{2}$  p. c. 2. 2 $\frac{1}{2}$  p. c. 3. The former. 4. £32. 5s.  
 5. 77 $\frac{1}{2}$ . 6. 190. 7. £1800; 2 years sooner.  
 8. £90,600. 9. £1824. 10. 91. 11. 82 $\frac{1}{2}$ .  
 12. £840. 13. 108 14. £9880 15. £30,000.  
 16. £4. 16s., 35 : 34. 17. 2261 : 2260. 18. £20,800.  
 19. 10. 20. £1000 and £2000 21. £400, £1200.  
 22. £3200. 23. 3 $\frac{3}{8}$  p. c. 24. £100. 25. £2700.  
 26. £242914 $\frac{24}{27}$ . 27. £75,000. 28. 100 $\frac{2}{3}$ .

## Examples. 172.

1. £275. 15. 5. 2. £3705. 7. 6. 3. 360. 4. £4. 17. 4.  
 5. £2. 13. 4 per dollar. 6. 110 7. £1 $\frac{1}{2}$  8. 14.  
 9. £25. 15a. 10. Advantageous through London.  
 11. £12. 18. 7 $\frac{13}{20}$  12. I lose 10 p. c. 13. 8s. 2d.  
 14. £83. 6. 8. 15. £56. 5s. 16. £1=1s. 8d. 17. £80.  
 18. £4687. 10s. 19. Gains £11. 5s. 20. 1s. 4d. per rupee.  
 21. 1 Gold Mohur = 71...eagle. 22. 1 Napo. = 8.55 rupees.  
 23. £1. 8a. 24. 2s. 1d. 25. One of the former = 2 of the latter.

## Examples. 172a.

1. 2305 Km. 2 3 Km. 4 Dm. 7 cm. 2 3 Km. 4 Dm. 7 cm.  
 3. 120 Dm. 3 m. 2 dm 7 cm 4 75073050 mm.  
 5. 30 Km 7 Hm 5 m. 8 cm. 6 mm 6. 23000807 sq. m.  
 7. 50060004 sq. Dm. 8. 4 ha 7 a. 40 ca. 9. 80700 ca.  
 10. 36 ha 30 a 70 ca. 11. 3 cu. m. 12 cu. dm. 35 cu. cm.  
 12. 5027004000 cu. mm 13. 40 Kl 7 Hl 3 dl 2 ml.  
 14. 3 Mg. 4 Hg. 6 gr. 15. 13 fr. 7 dec. 5 cent. 16. 1'1 m.

17. 4125 times.      18. 5 days.      19. 8 Kg. 5 Hg.  
 20. 3 fr. 75 c.      21. 3 a. 5 ca.      22. 200 hectolitres.  
 23. '914...metre.      24. '621...mile.      25. 29'921276 inches.  
 26. 453 6...grams.      27. 1'2255...grams.      28. 4545 45 cu cm  
 29. 8 tonneaux 825 kilo.      30. 1056 8...grams.      31. £7. 6s. 10½ d.  
 32. 220 lb.      33. 10 lb. nearly.      34. 5'25 m.      35. 1050 cm.  
 36. 5 francs.      37. (1) 1000, (2) 1000000.      38. 37500 cu. cm.  
 39. 4 m.      40. 1000 grams.      41. 28'41.      42. 136 ; 8.  
 43. 15 cm.      44. 13 times, '61 litres left.      45. 35'2.  
 46. 5 yd. 2 ft. 1'9051 in.      47. 121'8 ares.      48. 1'234 metres.  
 49. 453 grams.      50. 637 5 kilo.      51. 1'5 metres.      52. 1'8...francs.  
 53. £44.      54. 193 75 sq. yd.      55. 5'2 sq. metres.  
 56. (i) 2'54 cm.; (ii) 1550 sq. in.; (iii) 61 cu. in., (iv) 28 litres.  
 57. 16 grains.      58. 933'25 grams      59. 1360000 grams.  
 60. 1 hr. 25 min. 20 sec.      61. 0'7716.      62. 3727 litres.

### Examples. 173.

1. 30.      2. R94      3. R70.      4. 5. 3½ mi.  
 6. R18.      7. 5s. 10d.      8. Tea 2s., coffee 1s. per lb.  
 9. Tea 2s., sugar 6d per lb. 10. 2 and 5.      11. £900 and £300.  
 12. 25, 30 and 35 years.      13. 20, 10 and 15 years.  
 14. A R54, B R18, C R8.      15. R150.      16. R342 5.  
 17. 95, 60.      18. 40, 60.      19. 50, 300.      20. R6. 4a.  
 21. 5a.      22. 1 md. ; 5 md., 3 md.      23. 40 5/22 mi. per hr.  
 24. 24 507/83 mi.      25. 1122 ft.      26. 15 99/80 min.      27. 9 37/55 min.  
 28. 40.      29. 20.      30. 70 oz.      31. 12 gr.  
 32. 11 oxen, 24 sheep.      33. £8750.      34. 20 years'.  
 35. 3 p. c.      36. 3½ weeks.      37. 19.      38. 15 lb. 10 oz.  
 39. 44 days ; 2 : 1.      40. 200 cu. ft.      41. 3 hours.  
 42. 3 hours.      43. 65 gallons ; 13 hours.

### Examples for Exercise. 174a.

1. Ten billion, thirty thousand two hundred million, seven hundred and twenty thousand, and twenty-one.  
 2. 48910.      3. 473379.      4. 5<sup>4</sup>. 11<sup>2</sup>. 17.  
 5. 13.      6. 23'0424 ; 22'9596.      7. R4. 7. 9.

8. Three hundred and twenty crores, one lac, three thousand, one hundred and two.

9. 10091401. 10. R2.7.3. 11. 37. 12. 1 $\frac{5}{8}$ .  
 13. '0001595 ; '0051472. 14. 1 $\frac{1}{2}$ d. 15. 18508984.  
 16. 49110419796. 17. 17s. 9d. 18. 48345. 19. 5 $\frac{13}{60}$   
 20. 7045. 21. 1 $\frac{5}{3}$ . 22. CMXLIV, 499.  
 23. 33211521848. 24. 921. 25. 1 $\frac{1}{2}$ . 26. 15341134.  
 27. 026. 28. 15. 29. 765. 30. 27. 31. 32953856 dr.  
 32. 1 $\frac{5}{4}$ . 33. 5 $\frac{3}{10}$ . 34. 212. 35. £1. 3s. 5 $\frac{1}{2}$ d. 36. 13440.  
 37. R8. 3a 2 $\frac{3}{4}$ . 38. 1 $\frac{1}{10}$ . 39. 1 $\frac{19}{24}$ . 40. 3'0688259...  
 41. 2 $\frac{9968}{21975}$ . 42. R3. 12a. 43. 2. 44. 142114 $\frac{1}{2}$ .  
 45.  $\frac{3}{7}$ ,  $\frac{2}{5}$ ,  $\frac{27}{50}$ . 46. 1 $\frac{1}{2}$ . 47. 4. 48. '08.  
 49. 7. 50. 324. 51. 11. 52. 3 $\frac{5}{9}$ . 53. 700310.  
 54. 1'2375. 55. 125'56875d. 56. 1 min 30 sec.  
 57. 124727. 58. R16. 13a 3 $\frac{1}{2}$ . 59. 1 $\frac{3}{11}$ .  
 60. 3 po. 4 yd. 2 ft. 3 in. 61. 9, 7. 62. 424'8936.  
 63. 14. 64. 4536360. 65. 52084. 66. R110328. 1a. 6 $\frac{1}{2}$ .  
 67. 22 $\frac{3}{8}$ . 68.  $\frac{4}{7}$ . 69. 38. 70. 4828'04...  
 71. 5456. 72. 340 po. 5 yd. 1 in. 73. R466 9a.  
 74. 1 $\frac{1}{8}$ . 75. 11s. 8 $\frac{1}{2}$ d. 76. 426. 77. 709. 78. 137.  
 79. R1. 7a. 4 $\frac{1}{2}$ . 80. Saturday. 81.  $\frac{818}{888}$ . 82.  $\frac{1}{7}$ .  
 83. £. 84. 43 $\frac{1}{3}$ . 85. 729. 86. £125. 5s. 87.  $\frac{1}{4}$ .  
 88. 9405. 89. 120'712. 90. 7702 $\frac{1}{2}$  in.  
 91. 934'12 sq. yd. 92. R3 8a. 93. 5 and 7. 94. 2 $\frac{3}{8}$ .  
 95. 275 times ; rem. '003. 96. '3125. 97. 29400000.  
 98. 9, 6 and 4 times. 99. 326764. 100. 45.  
 101. 1 $\frac{18}{183}$ . 102. 1 $\frac{1}{8}$ . 103. '4461538. 104. 112'4.  
 105. 21 yd. 2 ft. 2 $\frac{1}{8}$  in. 106. 1753. 107.  $\frac{1}{5}$ .  
 108. 12a. 109. '000000142857. 110. '00759... 111. '8.  
 112.  $\frac{6}{7}$ . 113. 1296. 114. 1386 sq. yd. 3 ft 96 in.  
 115.  $\frac{2}{5}$ . 116. 3 $\frac{1}{2}$ . 117. 8. 118. R1. 8a. 8 $\frac{1}{2}$ . 119. 220.  
 120. 48. 121. 2s. 8 $\frac{1}{2}$ d. 122. 1 $\frac{1}{4}$ . 123. 13.  
 124. '330 $\frac{5}{7}$ . 125. 3 461538. 126. £182. 7s. 2d. 127. 13.  
 128. Wednesday. 129. 53. 130. 4 $\frac{1}{2}$ . 131. 20.  
 132. '0432. 133. 3840. 134. 2 $\frac{3}{4}$ . 3. 5 7.673 ; 37.19.101 ;  
 G. C. M. 21 ; L. C. M. 2 $\frac{3}{4}$ . 3. 5. 7. 19. 101. 673.

135. 26.      136. 1.      137.  $105752\frac{1}{2}$ .      138.  $5\frac{1}{5}$ .  
 139. 4288. 179204.      140. 250 times.

Examples for Exercise. 174b.

1. 3210 ; 1023.      2. 12.      3. 3.      4.  $16\frac{3}{4}$  min.
5.  $46\frac{3}{4}$ .      6.  $\frac{1}{7}$ .      7. 5 p. c.      8. 4, 7.
9. 4725.      10. 1050 sq. yd.      11. 6 h.  $27\frac{9}{13}$  m. P. M.
12. £46. 4a.      13. 3'2804.      14. 4.      15. 137.
16. 1250, 0125 ; 0000000125.      17. £5. 10a.
18. Monday 8 P. M. ;  $\frac{3}{16}$  min. to 6.      19. 10s. ; 6s. 8d. ; 2d.
20.  $1\frac{7}{15}$ .      21. 17s. 6d.      22. 1855.      23.  $8\frac{830}{245}$ .
24. 300 sq. yd.      25. 8 hr      26. £22. 8s.      27. 169 : 191.
28.  $9\frac{1}{4}$  p. c.      29. 999976 ; 100141.      30. 172.
31. 19251, 18261, 17271, 16281, 15291, 15201, 14211, 13221, 12231,  
 11241, 10251.      32.  $3\frac{1}{2}$  hr.      33. £9963.      34. 11 : 9.
35. 33 $\frac{1}{2}$ .      36. 5.      37. 14.      38. £750.      39. 7 h. 34 m. P. M.
40. £419. 19. 3.      41. 401 : 544.      42. 4 yr.      43. 150.
44.  $\frac{8}{11}$ .      45. 1015.      46.  $3\frac{1}{3}$  days.      47. 9 days, 48. 16 : 65.
49. £264. 6s. 8d.      50. 14.      51. 80.      52. £156.
53. 1 hr.      54. 70.      55.  $83 : 92$  ;  $92 : 153$ .      56. £4800.
57. 429. 58. 0.2. 59.  $11\frac{1}{2}$  gallons. 60. 11 P. M. 61. 12 da.
62. In the first vessel ratio of wine to water is 1729 : 271 ; in the  
 second 271 : 1729. 63. £4840, £4400, £4000. 64. 20.
65. 7'875. 66. 453750 tons. 67. 45 days. 68. 440 mi.
69. 7 : 1. 70. 53 $\frac{1}{2}$ . 71. 200. 72. 120. 73. 26.
74.  $17\frac{1}{2}$  mi. and  $9\frac{1}{2}$  mi. per hour. 75. 1s. 10 $\frac{1}{2}$ d.
76. Each man £3. 15s. , each woman £2. 10s. ; each child £1. 5s.
77. 4 mo. hence. 78. 250. 79. 388 ; 11'32 gr.
80. £19. 8a. 81. Loses  $1\frac{440}{1441}$  min. 82. 20 hr. 16 min.
83. 1200. 84. £276. 6. 1. 85. 8184 or 7434.
86. £10. 8s. 87. 126. 88. 12 hr.
89.  $18\frac{6}{13}$  days ; on the supposition that they work 13 hours a day.
90. A £540, B £360, C £240. 91. £621 $\frac{9}{11}$ . 92. £500.
93. 61000. 94. 24 yd. per min. 95. 9 hr.
96.  $113\frac{1}{828}$  gr. 97. £2. 13a. £4. 8a. 98. 10 for a rupee.
99. £1033. 100. 128'5016... 101.  $\frac{1}{2}$  in.

102. The clock ought to have been set at 5 h.  $30\frac{5}{8}$  m. P. M.  
 103. 150 mi. 104.  $A$ , R48,  $B$ , R40,  $C$ , R35. 105. R26.  
 106. 63. 107.  $\frac{875}{972}$  108. 16 ft. 109.  $12\frac{4}{5}$  hr.,  $A$ ,  $4\frac{4}{5}$ ,  $B$ ,  $5\frac{1}{5}$ .  
 110. R1. 8a. 111. 4a., 8a., R1. 8a., R4. 8a., R13. 8a.  
 112. R24  $\frac{7}{10}$ . 113. R660. 114. R24000 115. 73 times.  
 116.  $5\frac{1}{2}$  miles from  $P$ . 117. 10a. 118.  $A$ 's  $1\frac{3}{5}$  oz,  $B$ 's 2 oz.  
 119. R10. 120. £280 121. '0218... 122. 2 ft.  
 123.  $7\frac{9}{16}$  yd. 124. R9 7a 3d. 125. 40. 126. R3. 2a.  
 127. 46 128. '575 129. £12. 10s. 130.  $5\frac{3}{11}$  days  
 131.  $4\frac{1}{3}$  ft 132. 8 ft. 133. Will lose 7 p. c.  
 134. 120. 135.  $4\frac{4}{5}$  136. 15 yd. 137.  $1\frac{23}{28}$  hr.  
 138. £48 15s. 139. 35, 15, 10, 25 140.  $47\frac{1}{7}$  p. c.  
 141. R5 142. 576 0297502224. 143. 50 times.  
 144. They will run a dead heat. 145. 25. 146. 9  
 147. £10 148. 3 gallons. 149. £30. 14.  $8\frac{2}{5}$  150. 3 ft.  
 151.  $23\frac{1}{2}$  days. 152. 43 wk. 1 da. 2 hr. 153. 6 ft., 8 ft.  
 154. Loses  $53\frac{1}{2}$  p. c. 155. 78. 156. £8. 6s. 157. 121.  
 158.  $21\frac{3}{4}$  min. 159. R105000, 180 6  $\sqrt{2}$  in., 8  $\sqrt{2}$  in. 161.  $12\frac{1}{2}$ .  
 162. 42 gallons 163. 279,  $\frac{5}{8}$  164. Breadth, 6 yd; height, 5  
 165.  $25\frac{1}{2}$  min 166. R67 8a. 167. 224, 336, 420. 168.  $54\frac{2}{3}$ .  
 169. 72 170.  $1\frac{14}{15}$  171. 4 hr. 172.  $21\frac{5}{8}$  hr.  
 173. 66 min 174.  $A$  must pay 1s 3d and  $C$  is 6d to  $B$ .  
 175. £40 176. 11 177. £2359 15s 2  $\frac{86}{187}$  d 178. 1200.  
 179. 36 mi and 4 mi per hour. 180. 2333283  $\frac{1}{2}$  francs.  
 181. £1327 10s 182. 12. 183. 2313  $\frac{15}{21}$ . 184. 1115718.  
 185.  $21\frac{1}{2}$  ft., 242 times 186. 11  $\frac{1}{2}$  187. 3 188. £75.  
 189. The former; customer loses 2 05 oz in 1 lb  
 190. 58 miles. 191. 79 wk. 1 da 22 83 hr 192.  $263\frac{8}{11}$ .  
 193.  $3\frac{21}{47}$  days 194. £10 195. R300 196. 6800 : 7221.  
 197. 20th Oct 1855 198. 780 ac, 468 ac, 520 ac.  
 199. 3 times 200. 3426 yd. 201. (i) 40; (ii) 60; (iii) 80  
 202.  $A$ , R2476  $\frac{1}{21}$ ,  $B$ , R1523  $\frac{11}{21}$  203.  $99\frac{5}{8}$ , £176  $\frac{48}{21}$ .  
 204.  $1\frac{3}{4}$  d 205. 125 206. 3175 207.  $C$  wins by  $\frac{880}{8741}$  yd.  
 208. 19 ac 209. R345 210. R54 14a 4d; 3  $\frac{47}{105}$  p. c.  
 211. 14s 7  $\frac{3}{4}$  d.; 9d 212. '346574. 213. 1 min. 51  $\frac{1}{2}$  sec.

214. 60 days.      215. £606.      216. After 6 months.  
 217. £15400.      218. 2s. 2 $\frac{1}{2}$ d.      219. 1 $\frac{347}{1885}$ .  
 220. 5000 sq. ft.      221. 322 $\frac{2}{3}$  yards. 222. 29040 ft.  
 223. £76.      224. Gains £25 $\frac{605}{833}$ .      225. £550. 13s. 4d.  
 226. A, 1 $\frac{1}{16}$  of a chest; B, 1 $\frac{9}{16}$ , C, 1 $\frac{1}{16}$ .      227. 17 in.  
 228. 22 yd.      229. 43 $\frac{17}{82}$ .      230. A, £76; B, £76; C, £40.  
 231. £770; 1. 232. 10.      233. £860. 3s. 11 $\frac{1}{2}$ d.  
 234. 6 yd, 6 yd, 3 yd.      235. After 9 min.      236. 10.  
 237. 1 lb. to 2 lb.      238. 12; £1460.      239. £411. 12a.  
 240. 3s. 8 $\frac{935}{1685}$ d.      241. 7 in. each way; 7776.  
 242. 2 min. 27 $\frac{3}{11}$  sec.; 1080 yd.      243. 10.  
 244. Better 20 lb., worse 40 lb.      245. £500.      246. 11 $\frac{1}{2}$ .  
 247. £2364. 12s. 4 $\frac{1}{2}$ d.      248. 2 ft.      249. B wins by 88 yd.  
 250. £18.      251. 12 bus, 12 bus, 36 bus.  
 252. £5 $\frac{120}{885}$  decrease. 253. £4. 3a. 1 $\frac{1}{10}$ . 254. 10 $\frac{1}{2}$ . 255. 250 lb.  
 257. 13 $\frac{1}{2}$  days.      258. 3 : 2, (by volume).      259. £30780.  
 260. £276. 1a. 6d.      261. 5a. 7 $\frac{1}{2}$ d., £5498. 7a      262. 72 yd.  
 263. 1 min.      264. £43 $\frac{3}{11}$       265. 80 lb.      266. £1726. 10. 8.  
 267. 4a 3d. gain.      268. £1123. 15. 2.      269. 59 sq. ft. 21 in.  
 270. 39 yd.      271. 10 $\frac{1}{2}$  da.; 4 $\frac{7}{15}$  cu. ft.      272. 65.  
 273. £95197. 2a 1 $\frac{1}{2}$ d.      274. 2s. 3d. 275. 6d.      276. 12 yd.  
 277. 3 da.      278. 27 da.      279. 2 st 7 lb.      280. £16500  
 281. 3 $\frac{8}{11}$  mi.      282. 64.      283. 9 cu. ft. 1397 $\frac{1}{2}$  in.      284. 1 $\frac{1}{2}$  hr.  
 285. 27.      286. 40 yr.      287. 92.      288. 60.  
 289. £1508. 15s. 7 $\frac{11}{10}$ d.      290. 2399 lb. 7 $\frac{53}{100}$  oz.      291. 160 yd.  
 292. 4 $\frac{4}{185}$ a.      293. 1000 yd.      294. 17000 : 18067.  
 295. 3 $\frac{1}{2}$  pice.      296. £1668. 7s. 1 $\frac{5}{16}$ d.      297. £2. 9. 8.  
 298. 5 $\frac{1}{2}$  da.      299. 49. 300. 26 $\frac{6}{15}$ .      301. £89. 8. 9.  
 302. 9. 303. £370. 304. 161 sq. ft 21 $\frac{1}{2}$  in.      305. 25 mi.  
 306. 2176. 307. £1500. 308. £1350. 309. £2. 15. 7 $\frac{1}{2}$ .  
 310. 14 5.      311. 2 m.      312. 5 min.;  $\frac{1}{4}$  mi.      313. 68.  
 314. 10 $\frac{280}{5801}$  p. c. increase.      315. 12 p. c.      316. 4 yd.  
 317. 933 $\frac{1}{2}$  lb      318. 49 $\frac{1}{2}$  min.      319. 18 da.      320. 33 $\frac{1}{2}$ .  
 321. £44000 decrease.      322. £1705 $\frac{115}{187}$ , £173 $\frac{57}{181}$ .      323. 1.  
 324.  $\frac{3}{5}$ ,  $\frac{1}{2}$ ,  $\frac{4}{3}$ .      325. Faster 99 yd.; slower 77 yd.

326 £1. 18. 4. 327. Just passes 328 £6. 8. 11 $\frac{4}{5}$   
 329 4 $\frac{1}{2}$ . 330. £2. 3 $\alpha$  331. £900 332. 5 $\frac{5}{13}$  mi.  
 333. 2 $\frac{9}{25}$  334. 72 gall 335 4 $\frac{1}{2}$  p. c. 336 1s. 8d.  
 337. 9 $\alpha$  3 $\beta$  338. 144; 1 $\alpha$ . 339. 22 mi. 340. 4 $\frac{1}{2}$ .  
 341. £9230 $\frac{1}{2}$  342. £7995. 343. 1s 9 $\frac{21}{100}$ d 344. 5 $\alpha$ . 4 $\beta$ .  
 345. £150 15s 346. 80 min. 347. 2601. 348. £1925 $\frac{47}{50}$ s.  
 349. £1073. 4s 0 6560736d. 350. £30.

## Problems. 175.

1 942. 2. 10d. 3 11 $\frac{9}{11}$  in 4 1083.  
 5. 80 guineas, 128 half-crowns. 6.  $\frac{1}{10}$ . 7. 132. 8. £275.  
 9. 6 $\frac{1}{2}$ ; 156 $\frac{1}{2}$ . 10. 223 358..., 20 057...oz. 11. 34 $\frac{1}{2}$ .  
 12. The latter. 13. 3s 11 $\frac{3}{5}$ d 14. 15s 11 $\frac{1}{2}$ d, 15s 10d, 15s. 9d.  
 15. 3456, 2304 16. 126 qt. 18. £5, £3, £2. 19. 2632.  
 20. 3 21. 36. 22. 424 23. 60 24. 1 $\frac{15}{21}$  oz.  
 25. 120000 26. 11960 sq. yd. 4 ft. 20' 41 in.  
 27. 10 ft. 28. 10 $\alpha$  2 $\beta$ . 29. 1319 472 ft. 30. 33 $\frac{1}{2}$  lb.  
 31. 8s 32. £1025... 33. 395. 34. 46 $\frac{1}{2}$  hr.  
 35. £1026 36. 6 hr 59 $\frac{1}{2}$  sec 37. 54 times.  
 38. 11 days. 39. B, 31 $\alpha$ . 40. 13. 41. 50. 42. 1 $\frac{8}{11}$  mi.  
 43. 1 mile 980 yards; 13 $\frac{8}{9}$  miles 44. 2 $\frac{17}{10}$  hr. 45. £20  
 46. 36 $\frac{2}{3}$  mi. per hr., 8 h. 37 m. A.M. 47. 29 $\frac{1}{2}$  mi., 15 $\frac{8}{9}$  mi.  
 48. 9 $\frac{13}{20}$  mi. per hr. 49. 10 $\frac{2}{3}$  mi. 51. 115 min.  
 52. 167 min. 53. 25 mi 54. 11-30 A.M.  
 55. In 10 min. more 56. A £162, B £118, C £104.  
 57. A £1296, B £1872, C £1044 58. 30 59. 3.  
 60. £720, £1280. 61.  $\frac{4}{11}$ . 62. 11, 22 and 33 days.  
 63. Tea is 5 $\frac{1}{2}$ d, coffee 5s. 10d 64. 30 and 18.  
 65. 8 and 12 66. 2'20 lb. 67. 10 gall.  
 68. Man £250, each woman £62 8 $\alpha$ , each child £15. 10 $\alpha$   
 69. £24, £15, £1. 70. 30 yr. and 25 yr 71. 10 p. c.  
 72. 1021d. 73. £5. 7. 1 $\frac{5}{11}$ . 74. 30 times 75. 12s  
 76. £5000 77. 4 $\frac{1}{2}$  mi. per hr. 78. 42 $\frac{1}{2}$ .  
 79. 23 carats fine. 80. 4 $\frac{1}{2}$  mi. per hr. 81. £1 $\frac{8}{11}$ .  
 82. 9 gall. 83. 2 : 1. 84. 12 gall. 85. 5 $\frac{2}{3}$  gall.

86. 1 : 1. 87.  $3145 : 6424$ . 88. 2s. 4d. per stone.  
 89. R16060. 90. R2. 8a. ; 2a. 8s. 91. R7678. 2a. ; 10a. 2 $\frac{3}{4}$ s.  
 92. £7. 15s. 7 $\frac{5}{12}$ d. 93. 10, 25, 50, 75. 94. 18s.  
 95. A R2400, B R900, C R240, D R60. 96. 28800 ft.  
 97. 15 rich, 85 poor. 98. 27 $\frac{4}{15}$  cu. in. 99. R3923 $\frac{1}{3}$ .  
 100. R820. 101. 133. 102. 7 $\frac{1}{2}$ ; 4 $\frac{1}{2}$ s. 103. £818. 8s.  
 104. R12960, R11220. 105. £48000. 106. 6 $\frac{1}{2}$  p. c.  
 107. 48 mi. 108. £10. 108. 52. 110. R10538. 12. 6.  
 111. R14508, R12090, R12896, R9672. 112. £19 $\frac{1}{2}$ .  
 113. R4942 $\frac{8}{15}$ . 114. 45 mi. per hr. 115. The steamer ; 16 hr.  
 116. 25. 117. 76. 118. 35 measures. 119. 30 seers.  
 120. £690. 121. 52. 122. R9180. 123. 1050.  
 124. 15 ;  $\frac{73}{4000}$  cu. in. 125. £5. 14s. 126. 8400. 127. 144.  
 128. R5000. 129. 25. 130. 3 $\frac{1}{2}$  md. 131. 2 $\frac{1}{2}$  p. c. 132. 2d.  
 133. R1. 9a. 134. R450. 135. The second is R20 less.  
 136. 7. 137. 20 da. 138. R7. 8a, R10. 139. R7. 8a, R9.  
 140. 30. 141. R2. 142. 7 and 1. 143. R3. 12a.  
 144. By 3d. 145. 56306 $\frac{1}{4}$ , R257757 $\frac{863}{1160}$ .  
 146. 1166 $\frac{2}{3}$ , 1169, 1000, 1002. 147. 48 centres, 31 outers.  
 148. £4. 4s., £3, £1. 16s. 149. R8. 150. R4500.  
 151. R49. 152. 89. 153. 11. 154.  $\frac{1}{2}$ g in.  
 155. Each man, R2 ; woman, R2 ; boy, 12a. ; girl, 8a.  
 156. 7 : 40. 157. 10, 15, 20. 158. 75 p. c. and 25 p. c.  
 159. 6 $\frac{1}{2}$  cwt. alloy, 2 $\frac{1}{2}$  cwt. lead,  $\frac{1}{2}$  cwt. tin. 160. 8a, 6a, 4a.  
 161. 1 md. 162. R2. 163. 6a. 164. 15 hr.  
 165. 5 $\frac{5}{12}$  hr. 166. 4 hr. 20 min., 7 hr. 35 min.  
 167. R46. 10. 8. 168. 3 $\frac{9}{10}$  mi. 169. 4-25 P. M.  
 170. 18 mi. per hr. 171. 2 $\frac{1}{2}$  mi. 172. R46. 8a. 173. R37350.  
 174. 120. 175. 7 $\frac{41}{12}$  gr. 176. R5065 $\frac{1}{2}$  decrease.  
 177. 140, 168, 160 ; 840. 178. R15. 179. 20. 180. R400.  
 181. 15 $\frac{5}{8}$ . 182. £412. 10s. 183. English navvies ; £4000.  
 184. £1050. 185. £34. 8. 11 $\frac{11}{15}$ . 186. 1199. 365234375 sq. yd.  
 187. 18 $\frac{5}{8}$ . 188. 123 $\frac{1}{2}$ . 189. 2s. 8d. 190. 33 $\frac{1}{2}$ . 191. 12.  
 192. 48 of each kind. 193. 90 mi. 194. 60 p. c. 195. 31.  
 196. 21420. 197. R10022. 4a. 6 $\frac{3}{4}$ s. 198. £1239. 13s. 4 $\frac{80}{121}$ d.

199. £353. 11s. 7 $\frac{7}{17}$ d. 200. 3s. 7 $\frac{1}{3}$ d. 201. £2000.  
 202. 11s. 7 $\frac{2}{18}$ d. 203. 78 p. c. 204. £4654 $\frac{9}{11}$ , £135 $\frac{25}{33}$ , £9 $\frac{23}{33}$ .  
 205. 320. 206. £3. 17. 10 $\frac{1}{2}$ , 5s. 1 $\frac{1}{2}$ d. 207. 1100 ft. per sec.  
 208. 1 $\frac{1}{2}$  mi. and  $\frac{5}{8}$  mi. per hr. 209. 2<sup>2</sup> days after 2nd starts.  
 210. £13116. 6. 8. 211. 250  
 212. 8 min. 4 sec. ; 8 min. 15 sec. , 8 min. 26 sec. 213. 14 min.  
 214. R22 $\frac{3}{7}$ . 215 9 $\frac{17}{27}$  min. 216. R200. 217. 15 : 9 : 5.  
 218. 75 sec. 219. 29 $\frac{55}{183}$  mi. per hr. 220. £7. 11. 3.

## ANSWERS TO CALCUTTA ENTRANCE PAPERS.

1858.

1. 33 $\frac{1}{3}$ . 2.  $\frac{8427}{50000}$ . 3. 17320508... ; 5477225... 4. 1 $\frac{159}{181}$  oz.

1859, A.

1. 5 : 22. 2. 407 yd. 3. The former ; 2236. 4. 857 $\frac{1}{4}$  ac. ;  $\frac{61}{40}$ .  
 5. £2400. 15s. 0 $\frac{9}{16}$ d. 6. 13'427 poles ; 17325. 7. £1350.

1859, B.

1. 8333 hr. 20 min. 2. R6. 3. 1 $\frac{1}{2}$  ; '0079.  
 4. 10 $\frac{1}{18}$  5. '00064 ; '009 and 400000.

1860.

1. R9963. 2. 7564 ; 7071... 3. 29 ; 2. 4. R6.

1861.

1. 2243 $\frac{1}{18}$ . 2. '035 ;  $\frac{55}{17}$ . 3. £2142. 5s. 4 $\frac{1}{6}$ d.  
 4. 1103 $\frac{389}{100}$  ac. 5. '0316.

1862.

1. '54. 2.  $\frac{7}{500}$  ; 1s. 9d. 3. 4 $\frac{4}{13}$ s. a. 4. In 25 $\frac{1}{2}$  min. 5. '03162...

1863.

1. 11 $\frac{16}{6}$  ; 11'2388... 2. 3 $\frac{28779}{310400}$ . 3. £143. 7s. 11 $\frac{5}{16}$ d.  
 4. 14 $\frac{27}{5}$  days. 5. 31'052. 6. £529. 4s. 7 $\frac{5}{16}$ d

1864.

|                                  |                  |                                  |
|----------------------------------|------------------|----------------------------------|
| 1. 540.                          | 2. 1 ; 2.        | 3. £77. 14s. 7 $\frac{5}{16}$ d. |
| 4. 4 $\frac{1}{2}$ d. ; 5885416. | 5. '014 ; '0001. | 6. 6800 : 7221.                  |

1865.

|   |                  |
|---|------------------|
| 1. 79 $\frac{253}{32}$ ; 79.4048 ; 3415.                  | 2. '001764 ; 10. |
| 3. 329 $\frac{1}{16}$ yd. ; £1023. 9s. 7 $\frac{1}{2}$ d. | 4. 45 men.       |
| 5. £84. 1s. 10d. ; £16. 8s.                               |                  |

1866, A.

|   |                                 |
|---|---------------------------------|
| 1. 2183125 ; 120 $\frac{8}{7}$ ; 13316.875.                         | 2. £96. 16s. 9 $\frac{7}{8}$ d. |
| 3. 39.05 ; 12.348... ; 3d. 4. 12 days. 5. £2. 16s. 0.478447265625d. |                                 |

1866, B.

|                                   |   |
|-----------------------------------|---|
| 1. '10444637 ; 1.                 | 2. £21. 3s. 6 $\frac{1}{3}$ d.                        |
| 3. '00041616 ; 9.042 ; 21.7272... | 4. 256.256 ; '0256256.                                |
| 5. £210.                          | 6. 99 $\frac{5}{16}$ ; £176. 4s. 2 $\frac{11}{16}$ d. |

1867.

|  |  |
|--|--|
| 1. 19 mi. 836 yd. 2 ft. 2. 102960 ; 320.87. 3. Loses £1. 3s. 4d.   |  |
| 4. 2 ; 9 $\frac{569}{877}$ d. 5. $\frac{51}{10000}$ , '001275 ; $\frac{491}{288987}$ , '001699... 6. 9 $\frac{5}{8}$ . |  |

1868.

|                  |                                  |                         |
|------------------|----------------------------------|-------------------------|
| 1. 11s. 3d. ; 5. | 2. 12.375 ; 1.816...             | 3. 440 miles.           |
| 4. 401 : 544.    | 5. £12. 18s. 10 $\frac{5}{8}$ d. | 6. 58 $\frac{3}{4}$ yd. |

1869.

|  |  |
|--|--|
| 1. 4 ; '02392609126984.  | 2. £10. 10s. ; $\frac{1}{4}$ $\frac{1}{8}$ |
| 3. '02 ; '0000002 ; '1414... ; '0004... 4. £14. 7s. 11 $\frac{5}{8}$ d. 5. 16 years. |  |

1870.

|  |                                  |
|--|----------------------------------|
| 1. £15. 11 $\frac{1}{2}$ s. ; 8091 cu. ft. | 2. 998999 $\frac{3947}{4926}$ ;  |
| (1) '001353 ; (2) 290 ; 2.5227.            | 3. 140 $\frac{1}{2}$ ; 2.0025... |
| 4. 10 $\frac{2}{7}$ days. 5. Second.       | 6. 2070 $\frac{80}{871}$ .       |

1871.

1. R2732. 13a. 2.  $\frac{5}{8}$  greatest,  $\frac{23}{16}$  least ; £7. os. 3 $\frac{1}{2}$ d. , 1.  
 3. '001875 ; 67952'25 ; R68. 3a. 1 $\frac{1}{2}$ p. ; '154.  
 4. 55 miles. 5. R3250.

1872.

1. R1597. 10a. 3 $\frac{1}{2}$ p. 2.  $\frac{3}{4}$  ; R15. 2a. 4p. ; 2 $\frac{3}{8}$ .  
 3. 5050 ; (i) '075758 ; (ii) '677166 ; 30'84.  
 4. R197. 11a. 7 $\frac{7}{14}$ p. 5. R262. 8a.

1873.

1. (i)  $\frac{1}{5}$  ; (ii) R2569. 7a. 7p. ; R48. 2. '0033 ;  $\frac{1}{15}$  ; '5048...  
 3. R20. 11a. 2 $\frac{2}{3}$ p. 4. 19 yr. 5. 5a. 7 $\frac{1}{2}$ p. ; R5498. 7a.

1874.

1.  $\frac{80}{3}$  ; 1 : 161 ; 3328 226128... ; '230769. 2. 63 days.  
 3.  $3\frac{1}{2}^6$  cu. ft. ;  $15\frac{3}{4}^5$  cu. ft. 4. 120000.  
 5. R6666. 10a. 8p. ; R108.

1875.

1. 2 ; R50 ; '2213... 2.  $\frac{1}{4}$ . 3. R35. 1a. 4p.  
 4. R16540. 5. R58. 2a. ; 3 $\frac{2}{3}$ g.

1876

1.  $1\frac{3741}{10722}$  ; R13. 13a. 6 $\frac{1}{16}$ p. ; '4441... 2. 9 ; 23'04484...  
 3. 12 $\frac{1}{2}$  yd. ; R1. 12a. ; £215. 16s. 8 $\frac{1}{4}$ d. 4. 200 da. 5. 4 $\frac{1}{2}$ .

1877.

1.  $\frac{1}{2}$  ; £3. 9s. 2. R9105. 1a. 6p. 3. £78. 15s.  
 4. 125. 5. 39 days. 6. R3312 ; R219.

1878.

1. 2062'649... 2. 1'00015... 3. '375.  
 4. R24. 14a. 6 $\frac{1479}{1600}$ p. 5. '009945436507. 6. £512.19s. 1 $\frac{1}{3}$ d.

1879.

1.  $400, 50, 6, \frac{6}{10}, \frac{5}{100}, \frac{6}{1000}$ . 2. 104. 3. (a) 4, (b)  $1\frac{47}{210}$ ;  
(c) '027045; (d) '001. 4. 18 times. 5. 68 men.  
6. Decrease £11. 4s. 3d. 7. 18.

1880.

1. 100, 20, 3,  $\frac{4}{10}$ ,  $\frac{5}{100}$ ,  $\frac{6}{1000}$ ;  $\frac{1}{5}$ . 2. (a)  $\frac{76}{833}$ ; (b) £40; (c) 2'65.  
3. Each boy, £4. 11s.; each woman, £13. 13s.; each man, £27. 6s.  
4. 65 gallons; 13 hr. 5. C wins by  $\frac{880}{3741}$  yd. 6. R25.

1881.

2.  $4\frac{57}{140}$ ; 3. 3. '78125; R380. 6a. 4.  $4\frac{1681}{1100}$ ; 1'8549. 5. £15400

1882.

1. 4321. 2. £5. 18s. 9d., '57.  
3. 30030 sec.; 15016, 10011, 6007, 2003, 1431, 463, 391 times  
respectively. 4. (i) 1600; (ii) 27'96424... 5. 18 da. 6. R35000.

1883.

1.  $\frac{1}{2}$ . 2. 30; '75. 3. '00694; R6, £10. 10s. 10d.  
4. £21. 11s.  $2\frac{1}{4}$ d. 5. R96 $\frac{2}{3}$ . 6.  $28\frac{4}{7}$  years; R562. 8a.; 75 p.c.

1885.

1.  $2\frac{2}{5}; \frac{87}{850}$ . 2. '12; '2; '30472... 3. 3 46153 $\frac{8}{9}$ ; £1. 10s.  
4. £513. 6s. 6 $\frac{1}{2}$ d.; 3'1224..., '2828... 5. 18,  $8\frac{9}{53}$  per cent.  
6. The first investment is better; £1342. 10s.;  $3\frac{63}{175}$  per cent

1886.

1.  $\frac{875}{172}$ . 2.  $\frac{209}{6000}$ . 3.  $4\frac{15}{16}; \frac{279}{800}$ . 4. '5; '001136.  
5. £36. 17s. 6d. 6. R28659. 6a. 7. R12. 12a. 9 $\frac{3}{4}$ d.; gain R133 $\frac{1}{2}$ .

1887.

1. (a)  $\frac{1}{5}$ ; (b) 350. 2. '0203125. 3. (a) £17. 12s. 2 $\frac{1}{2}$ d.,  
(b) R2000. 4. 10. 5. R510. 6. 13'31; '471...

1888

1.  $\frac{5}{12}$ . 2. 11200 ; 37'96. 3. 138'4497*i* ; £20. 16*s*. 9*7*<sub>10</sub>*d*.  
 4. £1034. 14*s*. 4*3*<sub>8</sub>*d*. 5. 15*8* days. 6.  $6\frac{1}{2}$ , £100.

1889.

1. 51 59139412. 2. 862126... 3. £5247. 2*s*. 6*8*<sub>4</sub>*d*.  
 4. 1'000127... 5. £6705. 14*s*. 7*d*.

1890.

1. 3, R23931. 7*a*. 7*p*. 2. 7305'40*5* ;  $\frac{12}{17}$ *8*.  
 3. R1771. 4. 60 days. 5. R104. 4*a*.

1891.

1. (a)  $\frac{1}{2}\frac{8}{9}$ , (b)  $\frac{3}{4}$  2. 2 202642. 3. R408. 3*a*. 4*1\frac{1}{2}**d*.  
 4. 9 hr. 41*7*<sub>13</sub> min. 5. R20800. 6.  $8\frac{1}{3}$  yd.

1892.

1.  $\frac{19}{185}$ . 2. 26219. 3. '312 ; '098 ; '998.  
 4. R1232. 14*a*. 0*2\frac{1}{2}**d*. 5. £2500.

1893.

1. (1) 5*57*<sub>10</sub> ; (2) 3. 2. '0789,  $\frac{226}{277}$  ;  $\frac{36}{55}$  ; 1*i*. 3. £345. 7*s*. 3*8*<sub>4</sub>*d*.  
 4. R238 3*a*. 2*1\frac{2}{3}**d*.  
 5. R90,000 in the 4 per cent. stock and R73,000 in the 5 per cent. Municipal debenture stock.

1894.

1. £37. 0*s*. 8*1*<sub>2</sub>*d*. 2. £491. 8*s*. 3. 16*s*. 0'37501*3*<sub>4</sub>*d*.  
 4. '9998 5. 6 Rupees per head.

1895.

1. 1'00001. 2. R12345. 3. 3 francs 84 centimes. 4. 1.  
 5. Increase of R47 ; '6832876712.

1896.

1. Greatest number = 23704543, and least number = 8143.  
 2. (1)  $\frac{5}{12}$ , (2) '075088. 3. 2 2677... 4. R531. 3*a*. 10*1\frac{2}{3}**d*.  
 5. 1*8* per cent. loss. 6. R21735.

1897.

1. .0725. (a)  $\frac{2}{15}$ . 2. Yes, 320th part; R32. 9a.  $1\frac{1}{8}p$ .  
 3. 20. 4.  $33\frac{1}{3}$  yr. 5. R6 per share. 6. 17724...

1898.

1. 20150. 2.  $\frac{11}{16}$ ; .083. 3. 234; 8.0600.  
 4. R250. 5.  $1\frac{1}{2}$  per cent. profit. 6. R23400.

1899.

1. 25. 2.  $1\frac{1}{2}$ ;  $\frac{22}{7}p$ . 3. R606. 11a.  $9\frac{3}{4}p$ .  
 4. 226; .226. 5.  $3\frac{1}{3}\%$  per cent. 6. R18.

1900.

1. 2520 secs. 2. 6;  $\frac{1}{24}$ . 3. 8.  
 4. £55. 10s.  $3\frac{1}{2}d$ . 5. 125. 6. Gains R100.

1901.

1. (a) 1.416; (b) .565. 2. (a) Yes; (b) £68. 15s. 9d.  
 3. 4 lb. 8 oz. 4. 4 per cent. 5. 86.42. 6. R1; 22; 169.

1902.

1. (a) Terminating. (b)  $\frac{1}{35}$ , .036. 2. R15326. 10a. 8p.; R7340.  
 3. 35 boys. 4.  $2\frac{1}{4}$ ; 8729. 5. £100. 6. 4 per cent. R60.

1903.

1. (a) 1; (b) .000568i. 2. Yes; (b) £170. 19s.  $4\frac{1}{2}d$ .  
 3. 1 $\frac{2}{3}$  min. 4. (b)  $3\frac{1}{6}$ ; 1.5118... 5.  $1\frac{3}{5}$  gallon. 6. (b) R50.

1904.

1. (a) 997920. 2. (a)  $\frac{1}{2}$ . 3.  $22\frac{1}{2}$  days.  
 4. 39.6 poles. 5. £700. 6. R151710.

1905.

1. 165. 2.  $\frac{13}{5}$ . 3. 4.467; .791.  
 4. R4. 1a. 5. R110. 7a.  $2\frac{1}{2}p$ ., 3 p. c. 6. £3000.

1906.

1. (2) 99679. 2. (2) (a) 1; (b) 2. 3. R17. 2a.  
 4. 1667; .7746. 5. 17s. 6d. 6.  $11\frac{1}{2}$  p. c.

1907.

1. 37128. 2. (1)  $\frac{1}{3}$ ; (2)  $\frac{1}{4}$ . 3. R46. 11a 10 $\frac{1}{2}$ p.  
 4. 110400. 5. R760. 8a 6. 13s. 38 $\frac{5}{8}$ s $\frac{1}{2}$ d.

1908.

1. (1) Non-terminating; (2) R1. 8a. 2. £934. 18. 2.  
 3. (a) Loses 11 $\frac{19}{22}$  min; (b) D wins by 7 $\frac{1819}{488}$  yd.  
 4. (a) 2 $\frac{8}{23}$ ; (b) '5345. 5. R1000 6. Incr. R425.  
 Alter: 2. 2038 $\frac{181}{488}$  gall. 4. R5746. 8a.; 6 $\frac{1}{2}$  p. c.

1909

2. (1) 7, (2) 65. 3. R939. 13. 6, 371. 173.  
 4. R1228. 2a, £588. 10. 10.  
 5. 3, 11, 59, 33, 177, 649, 1947, 20 p. c.

ANSWERS TO CALCUTTA MATRICULATION PAPERS.

1910.

*Compulsory Paper.*

1. (b) 504, 17280. 2. (1) 167 $\frac{1}{15}$ , (2) '009. (b) 40.  
 3. (1) R3816. 10a. 8p. (2) 16 $\frac{2}{3}$  yr. (b) 2'115...cu. in.

*Additional Paper.*

1. 2501317. (b) 15 ft. 2. (1) See p. 141; (2) 24855.296...miles

1911.

*Compulsory Paper.*

1. (b) R610 2. (1) 1, (2) '0052083. (b) '00027.  
 3. (1) R31. 15a. 5p. (2) £227. 12s (b) 180 men.

*Additional Paper.*

1. 469246, 54'0321; 579 men 2 (1) 3'14159; (2) 28.

1912

*Compulsory Paper*

1. (b)  $\frac{52}{115}$ . 2. (1)  $\frac{7}{15}$ , (2) £12 13s. 2d. (b) (1) 3 $\frac{1}{2}$  p. c.;  
 (2) R442. 7a. 7 $\frac{1}{2}$ p. 3. 25 men (b) 2624 sq. ft.; R95 10a. 8p.

*Additional Paper.*

1. 371.173. (b) 117 ft. 2 24855 miles (b) '54931.

1913.

*Compulsory Paper.*

1. (2) 504 ; (b) 1890
2. (1)  $\frac{1}{8}$  ; (2) 0.2907. (b) (1) 0.0015625 ; (2) £2362.8a.
3. (1) 3 p. c. ; (2) 28 yd.

*Additional Paper.*

1. 5403 ; (b) £366.10s. 8d. 2. 239.197... , (b) See p. 79.

1914.

*Compulsory Paper.*

1. 278523 $\frac{81}{875}$ . 2. 247 ; (b) 2160.
3. £14650. 3a. 6 $\frac{3}{4}$ d. 4. 45.408d. (b) £564.5a. 4d.

*Additional Paper.*

1. 2646. 2. 20.8...

1915.

*Compulsory Paper.*

1. (1) 75154060188. (b) 7908. (2) 504. (b) 28000.
2. (1)  $\frac{2}{3}$ . (2) 70.2702 ; 85 8 (b) (1) 11.9384615. (2) £5615.9a. 3d.
3. (1) 10 p. c. (2) £3072.

*Additional Paper.*

1. 13.057. 2. 3937  $\times$  3937. (b) 41937.

1916.

*Compulsory Paper.*

1. (2) 119 ; (b) 2520. 2. (1) 1 ; (2) 0.00416. (b) (1) 1035546875 ; (2) £173.8s.
3. (1) 12 $\frac{1}{2}$  p. c. ; (2) 60,men.

*Additional Paper.*

1. .06435. 2. .097... ; (b) 1.732.

1917.

*Compulsory Paper.*

1. (a) 272428968895 ; 101793. (b) 756 ; 89 ft. 3 in.
2. (a)  $\frac{3}{4}$  ; 5s. 0 $\frac{1}{2}$ d. (b) 30 ; 58 $\frac{1}{2}$ .
3. (a) £106.7a. ; £37.2a 8d. (b) 12 $\frac{1}{2}$  p. c. ; 23 p. c.

*Additional Paper.*

1. 7589 ; 1414 mm. 2. 1.6487 ; 1.2501.

ANSWERS TO PATNA MATRICULATION PAPERS,  
1918.

## COMPULSORY PAPER.

1. (a) 496788793655 ; 5000  
 (b) 9168 ; 125.  
 2. (a) 1 ; £906 7s 11d.  
 (b) 1043225, 011875, 15s. 9d., 1575  
 3. (a) Rs 500 ; 25 years. (b) 10 days.

## ADDITIONAL PAPER.

1. 1001333. 2. 453 litres nearly. 3. 4055. 4. 176400.

1919

## COMPULSORY PAPER.

1. (a) 604356745368450, 999663, 100203. (b) 875 ; 9d.  
 2. (a) 1, '2083 (b) £2. 15s. 11½d. ; £183 12s. 4d.  
 3. (a) £315. 10s. 8d., 9s. 08d. (b) Half-an-hour ; 5 hours.

## ADDITIONAL PAPER.

1. '0499976 ; £220. 2. 8 Km. 47 m. ; '6321.

1920.

## COMPULSORY PAPER

3.  $\frac{181}{281}$ . 4.  $1\frac{1}{18}$ . 5. '0703125.  
 6. £1571. 9s. 08d. 7. £3200.

## ADDITIONAL PAPER.

1. (a) '0006 ; (b) 142 yards

1921.

2.  $\frac{43}{1850}$  3. 31'371539, 2312. 4. £2 15s. 11½d. ; £10. 7s. 6d.  
 5. 4½ p. c ; 3703½ guineas.

1922.

2. 47. 3. Rs 420. 4. Rs 3289. 6a. 9 $\frac{17}{33}$  p. ; Rs 472.  
 5. 5198 ; 21 yrs. 4 mths.

1923.

1. 709 2. 257040. 4. £37'97925 ; Rs 4527 3a. 2½ p.  
 5. 2 times, Rs 45 each

1924.

2. 997920 3. Rs 2650. 5a. 3½ p. ; 9 45. 4. 55 men.  
 5. 967 5 francs ; 23 p. c.

## APPENDIX I.

A. To prove that the multiplier and multiplicand may be interchanged without altering the value of the product.

For example, to prove that  $5 \times 4 = 4 \times 5$ .

Place 5 dots in a line, and repeat this line 4 times. The number of dots in a row is 5, and there are 4 rows; therefore the number of dots altogether is 5 multiplied by 4. Again the number of dots in a column is 4, and there are 5 columns; therefore the number of dots altogether is 4 multiplied by 5. Hence  $5 \times 4 = 4 \times 5$ .

B. The product of a recurring decimal by a whole number or by a terminating decimal may be obtained without converting them into vulgar fractions. It is evident that the product in such a case will be a recurring decimal, and that its period will contain as many digits as there are in the period of the multiplicand.

*Example 1.* Multiply 3.2456 by 7, 7.14 by 4 and 1.236 by 11.

|                              |                               |   |
|------------------------------|-------------------------------|---|
| (i) $3.2456$                 | (ii) $7.14$                   | (iii) $1.236$                                   |
| $\frac{7}{22.7192}$          | $\frac{4}{28.56}$ <i>Ans.</i> | $\frac{11}{13.596}$                             |
| $\underline{22}$             | $\underline{28}$              | $\underline{13}$                                |
| $\underline{\underline{71}}$ | $\underline{\underline{56}}$  | $\underline{\underline{596}}$                   |
| $\underline{\underline{95}}$ |                               | $\underline{\underline{99}} = 13.6$ <i>Ans.</i> |

Here, we multiply in the usual way, and increase the last figure in the result by the figure (if any) carried from the first (to the left) column of the period of the multiplicand.

*Example 2.* Multiply 6.227 by 8.26.

|                              |                      |   |
|------------------------------|----------------------|---|
| (a) $6.227$                  | (b) $6.227$          | (c) $6.227$                                   |
| $\frac{8.26}{37362+1}$       | $\frac{8.26}{37363}$ | $\frac{8.26}{37363}$                          |
| $\underline{12454}$          | $\underline{12454}$  | $\underline{124545}$                          |
| $\underline{49816}$          | $\underline{49818}$  | $\underline{4981818}$                         |
| $\underline{\underline{+2}}$ |                      | $\underline{\underline{5143726}}$             |
|                              |                      | $\underline{\underline{I}}$                   |
|                              |                      | $\underline{\underline{5143727}}$ <i>Ans.</i> |

Here, first we multiply as in the case of whole numbers, and increase the last figure of each partial product by the figure (if any) carried from the first (to the left) column of the period of the

multiplicand. Thus we get (8). We now add these lines in the usual way, but to do this correctly we extend each line (except the top line) as far as the right-hand figure of the top line, by repeating the digits of its period. The number of decimal places as far as the end of the first period in the result must be  $3+2$ , i.e., 5. We therefore place the decimal point to the left of the 5th figure from the end ; and the required product is  $51.4372\dot{7}$ .

$$\text{Example 3. } 1.32\dot{5}\dot{6} \times 10 = 13.2\dot{5}\dot{6}.$$

$$\text{Example 4. } .32\dot{5}\dot{6} \times 100 = .32\dot{5}\dot{6}2 \times 100 = 32.562.$$

$$\text{Example 5. } .\dot{5} \times 1000 = .555\dot{5} \times 1000 = 555.\dot{5}.$$

C. To divide a recurring decimal by a whole number, we proceed as in ordinary division ; but instead of bringing down a zero each time we bring down the digits of the period in rotation. If the divisor is a terminating decimal, we multiply it by that power of 10 which will make it a whole number, and also multiply the dividend by the same power of 10 ; and proceed as in the case of divisor by a whole number.

*Example 1.*

Divide  $32\dot{6}2\dot{4}$  by 5.

$$5 ) \underline{32\dot{6}242424\ldots} \\ \underline{6\cdot5248484\ldots}$$

The quotient is  $6\cdot5248$ .

*Example 2.*

Divide  $2\dot{7}\dot{2}\dot{3}$  by 53.

$$\begin{array}{r} \text{Quot.} = .0513817\ldots \\ 53 ) \underline{27232323\ldots} \\ \underline{265} \end{array}$$

$$\begin{array}{r} 73 \\ \underline{53} \\ 202 \\ \underline{159} \\ 433 \\ \underline{424} \\ 92 \\ \underline{53} \\ 393 \\ \underline{371} \\ 22 \end{array}$$

If we had to divide  $2\dot{7}\dot{2}\dot{3}$  by  $.053$ , we should divide  $2723\dot{2}\dot{3}$  by 53.

## APPENDIX II.

When an algebraical formula is applicable, it may be used with great advantage in simplifying fractions.

*Example.* Simplify  $\frac{.704 \times .704 - .296 \times .296}{.704 - .296}$ .

Let  $.704 = a$ , and  $.296 = b$ . Then the given fraction

$$= \frac{a^2 - b^2}{a - b} = \frac{(a+b)(a-b)}{a-b} = a+b = .704 + .296 = 1. \quad Ans.$$

### Examples for Exercise.

Simplify :

$$1. \quad \frac{\frac{1}{408} \times \frac{1}{408} - \frac{1}{459} \times \frac{1}{459}}{\frac{1}{408} - \frac{1}{459}}.$$

$$2. \quad \frac{\frac{1}{2} \text{ of } .125 - \frac{1}{8} \text{ of } .06}{.125 + .06}.$$

$$3. \quad \frac{(3^2)^3 + (2^2)^3 - (6^2)(2^2)}{(1^2)^3 + (2^2)^3 + (3^2)(2^2)}.$$

$$4. \quad \frac{(.0179)^2 - (.0178)^2}{(.0026)^2 - (.0025)^2}.$$

$$5. \quad (967 + \frac{1}{987})(967 + \frac{1}{987}) - (967 - \frac{1}{987})(967 - \frac{1}{987}).$$

$$6. \quad \frac{.1 \times .1 \times .1 + .01 \times .01 \times .01}{.2 \times .2 \times .2 + .02 \times .02 \times .02}. \quad 7. \quad \frac{(\frac{2}{3} \text{ of } \frac{3}{2}) - (\frac{2}{3} \text{ of } \frac{3}{2})}{(\frac{2}{3} \times \frac{2}{3} \times \frac{2}{3}) - (\frac{2}{3} \times \frac{2}{3} \times \frac{2}{3})}.$$

$$8. \quad \frac{(.03 + .02)(.03 + .02) + (.03 - .02)(.03 - .02)}{(.03 \times .03) + (.02 \times .02)}.$$

$$9. \quad \left( \frac{239}{241} + \frac{241}{239} - 2 \right) \div \left( \frac{241}{239} - \frac{239}{241} \right).$$

$$10. \quad \{(\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}) + (\frac{1}{3} \times \frac{1}{3} \times \frac{1}{3})\} \div \{(\frac{1}{2} \times \frac{1}{2}) - (\frac{1}{3} \times \frac{1}{3}) + (\frac{1}{3} \times \frac{1}{3})\}$$

$$11. \quad \frac{.07 \times \{(07)^2 + 1\} \times \{(07)^2 - 07\} \times (07 + 1)}{(07)^4 - 1}.$$

$$12. \quad \frac{\frac{1}{4} \times \frac{1}{2} - 2 \times \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{4} - \frac{1}{2} \times \frac{1}{4}}{\frac{1}{4} \times \frac{1}{2} - 2 \times \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} - \frac{1}{2} \times \frac{1}{2}} \quad 13. \quad \frac{\frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{4} + \frac{1}{2} \times \frac{1}{4} + \frac{1}{2} \times \frac{1}{2}}{\frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2}}.$$

14. 
$$\frac{(\frac{1}{2} - \frac{1}{3})(\frac{1}{4} + \frac{1}{5})}{(\frac{1}{2} + \frac{1}{3})(\frac{1}{3} + \frac{1}{4}) - (\frac{1}{3} + \frac{1}{4})(\frac{1}{2} + \frac{1}{5})} \times \left( \frac{1}{\frac{1}{2} + \frac{1}{4}} + \frac{1}{\frac{1}{3} + \frac{1}{5}} \right).$$

15. 
$$\frac{(-5)^4 + (-5)^0 \cdot (-5)^2 + (-5)^4}{(-5)^4 + (-5) \cdot (-5) + (-5)^2}.$$
 16. 
$$\frac{(\frac{1}{2})^4 + (\frac{1}{10})^2 + (\frac{1}{5})^4}{(\frac{1}{2})^2 - (\frac{1}{10}) + (\frac{1}{5})^2}.$$

17. 
$$\frac{(\frac{1}{2} \times \frac{1}{3} \times \frac{1}{5} \times \frac{1}{7}) + (\frac{1}{2} \times \frac{1}{3} \times \frac{1}{6} \times \frac{1}{8}) + (\frac{1}{6} \times \frac{1}{5} \times \frac{1}{7} \times \frac{1}{9})}{\{(\frac{1}{2} \times \frac{1}{3}) + (\frac{1}{2} \times \frac{1}{5}) + (\frac{1}{6} \times \frac{1}{8})\} \times \{(\frac{1}{2} \times \frac{1}{3}) - (\frac{1}{2} \times \frac{1}{5}) + (\frac{1}{6} \times \frac{1}{8})\}}.$$

18. 
$$\frac{(\frac{1}{2} \times \frac{1}{3} \times \frac{1}{5}) + (\frac{1}{2} \times \frac{1}{3} \times \frac{1}{7}) + (\frac{1}{5} \times \frac{1}{3} \times \frac{1}{6}) - 3(\frac{1}{2} \times \frac{1}{3} \times \frac{1}{6})}{\{(\frac{1}{2} \times \frac{1}{3}) + (\frac{1}{2} \times \frac{1}{7}) + (\frac{1}{5} \times \frac{1}{6})\} - \{(\frac{1}{2} \times \frac{1}{3}) + (\frac{1}{2} \times \frac{1}{5}) + (\frac{1}{5} \times \frac{1}{6})\}}.$$

19. 
$$.54 \times .54 \times .54 + .46 \times .46 \times .46 + 3 \times .54 \times .46.$$

20. 
$$\frac{\frac{1}{2} \times \frac{1}{3} \times (\frac{1}{5} + \frac{1}{6}) + \frac{1}{5} \times \frac{1}{7} \times (\frac{1}{3} + \frac{1}{4}) + \frac{1}{3} \times \frac{1}{5} \times (\frac{1}{4} + \frac{1}{6}) + 2 \times \frac{1}{5} \times \frac{1}{7} \times \frac{1}{4}}{\frac{1}{3} \text{ of } \frac{1}{3} + \frac{1}{3} \text{ of } \frac{1}{5} + \frac{1}{3} \text{ of } \frac{1}{7} + \frac{1}{3} \text{ of } \frac{1}{4}}.$$

## APPENDIX III.

### Additional Examples on H. C. F. and L. C. M

1. Find the two numbers lying between 100 and 200, of which the H. C. F. is 48.
2. Find the two numbers which lie between 100 and 200 and which have 36 as their H. C. F.
3. Find the two numbers lying between 200 and 300, of which the H. C. F. is 37.
4. Find the numbers lying between 400 and 500, which are divisible by 12, 15, and 20.
5. Find numbers lying between 200 and 300, which when divided by 6, 8 or 9 will leave a remainder 5 in each case
6. Find the greatest number and the least number which being subtracted from 3000 will make the result divisible by 7, 11 and 13.
7. What is the least number that must be added to and what is the greatest number that must be subtracted from 9999 that the results may be divisible by 777, 819 and 4329?
8. Find the greatest and least numbers of six digits which are divisible by 27, 45, 60, 72 and 96.
9. The H. C. F. of two numbers is 21 and the L. C. M. is 4641, one of the numbers lies between 200 and 300, find the numbers.
10. Find the three largest numbers such that their H. C. F. is 7 and their L. C. M. is 1155.
11. What numbers of four digits each can have 143 as their H. C. F. and 25025 as their L. C. M.?
12. Find the least number which when divided by 12 and 16 will leave the remainders 5 and 9 respectively [Here,  $12-5=7$ , and  $16-9=7$ , therefore if 7 be added to the number required the sum will be divisible by both the numbers 12 and 16. Now the L. C. M. of 12 and 16 = 48; ∴ the number required =  $48-7=41$ ]
13. Find the least number which when divided by 24 and 36 will leave the remainders 14 and 26 respectively
14. Find the least number which when divided by 48, 64, 72, 80, 120 and 140 will leave the remainders 38, 54, 62, 70, 110 and 130 respectively